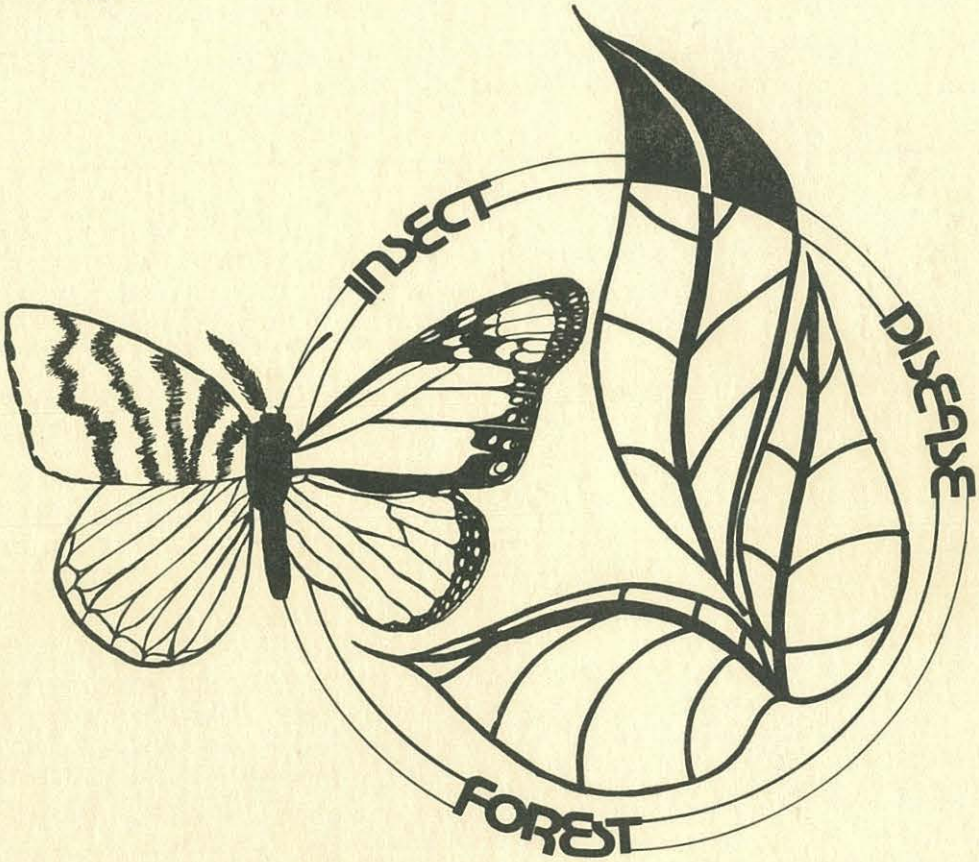
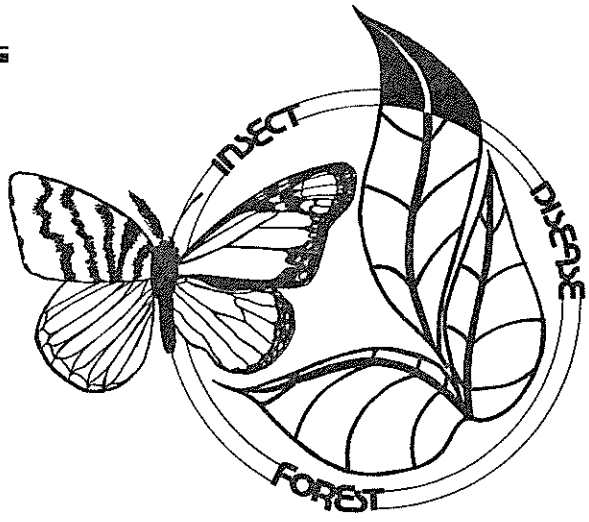
MISSOURI FOREST PEST REPORT 1981



FORESTRY DIVISION
MISSOURI DEPARTMENT OF CONSERVATION

MISSOURI FOREST PEST REPORT



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2. Bronze Birch Borer, Agrilus anxius, (Gory)
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4. Cottonwood Borer, Plectrodera scalator, (F.)
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12. Loblolly Pine Sawfly, Neodiprion taedae linearis, (Ross.)
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22. Walnut Caterpillar, Datana integerrima, (G. & P.)
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1. Asiatic Oak Weevil, Cyrtepistomus castaneus, (Roelofs)
2. Catalpa Sphinx, Ceratomia catalpae, (Bdv.)
3. Green-stripped Mapleworm, Anisota rubicunda, (F.)
4. Ips Beetle, Ips sp.
5. Juniper Sawfly, Monoctenus melliceps, (Cresson)
6. Monarch Butterfly, Danaus plexippus, (L.)
7. Pin Oak Sawfly, Caliroa lineata, (MacGillivary)
8. Obscure Scale, Melanaspis obscura, (Comstock)
9. Periodical Cicada, Magicicada septendecim, (L.)
10. Pine Needle Scale, Phenacaspis pinifoliae, (Fitch)
11. Saddleback Caterpillar, Sibine stimulea, (Clem.)
12. Twig Girdler, Oncideres cingulata, (Say)
13. Viceroy Butterfly, Limentis archippus, (Cramer)
14. Walking Stick, Diapheromera femorata, (Say)
15. Wheel Bug, Arilus cristatus, (Linn.)
16. White Pine Bark Aphid, Pineus strobi, (Htg.)

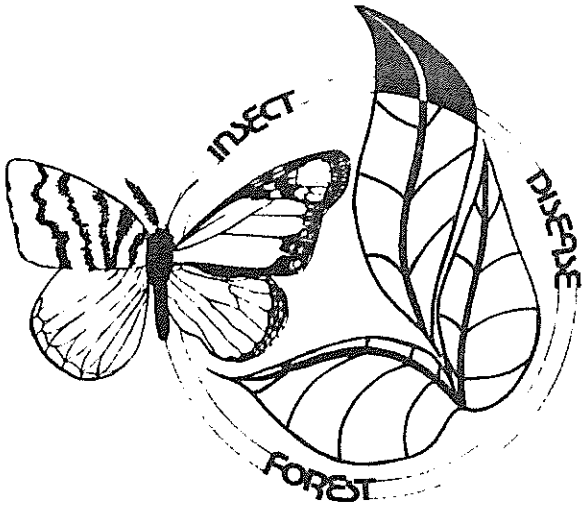
DISEASES OBSERVED IN 1981 - DISCUSSED IN REPORT

1. Brown-Spot Needle Blight, Scirrhia acicola (Dearn.) Sigg.
2. Diplodia Tip Blight, Diplodia pinea (Desm.) Kickx.
3. Oak Wilt, Ceratocystis fagacearum (Bretz) Hunt
4. Naemacyclus Needle Cast, Naemacyclus minor Butin
5. Pine Wilt Disease, Bursaphelenchus xylophilus (Steiner and Buhrer) Nickle
6. Rhizosphaera Needle Cast, Rhizosphaera kalkhoffii Bub.
7. Sycamore Anthracnose, Gnomonia platani Edg.

DISEASES OBSERVED IN 1981 - NOT DISCUSSED IN REPORT

1. Ash Anthracnose, Gloeosporium aridum Ell. & Holw.
2. Ash Decline, unknown
3. Bacterial Wetwood, Erwinia nimipressuralis (Burr.) Winsl.
4. Black Knot of Plum and Cherry, Dibotryon morbosum (Schw.) Th. & Syd.
5. Botryosphaeria Canker of Sweetgum, Botryosphaeria ribis (Tod. ex Fr.) Gross. & Duq
6. Catalpa Leaf Spot, Alternaria catalpae (Ell. & Martin) J.B. Parker
7. Cedar-Apple Rust and Cedar-Hawthorn Rust, Gymnosporangium spp.
8. Cytospora Canker of Sassafras, Cytospora sassafras Ell. & Ev.
9. Cytospora Canker of White Fir, Cytospora abietis Sacc.
10. Dothiorella Canker of Oak, Dothiorella quercina (Cke. & Ell.) Sacc.
11. Dothistroma Needle Blight, Dothistroma pini Hulb.
12. Dutch Elm Disease, Ceratocystis ulmi (Buism.) C. Moreau
13. Eastern Gall Rust, Cronartium quercuum (Berk.) Miy. ex Shirai
14. Elm Anthracnose, Gloeosporium inconspicuum Cav.
15. Elm Phloem Necrosis, mycoplasma
16. Fire Blight, Erwinia amylovora (Burr.) Winslow et al.

17. Hypoxylon Canker of Oak, Hypoxylon spp.
18. Lophodermium Needle Cast, Lophodermium pinastri (Schrad. ex Hook.) Chev.
19. Maple Anthracnose, Gloeosporium apocryptum E. & E.
20. Maple Decline, unknown
21. Marssonina Leaf Spot of Ash, Marssonina fraxini Ell. & J.J. Davis
22. Multiflora Rose Dieback, Xanthomonas sp.
23. Nectria Canker, Nectria galligena Bres.
24. Norway Spruce Canker, Phoma sp.
25. Oak Anthracnose, Gnomonia quercina Kleb.
26. Pecan Anthracnose, Gnomonia caryae Wolf.
27. Pecan Bunch Disease, mycoplasma
28. Pecan Scab Disease, Fusicladium effusum Wint.
29. Phomopsis Blight, Phomopsis juniperovora Hahn
30. Pin Oak Chlorosis, iron deficiency
31. Thyronectria Canker, Thyronectria austro-americana (Speg.) Seeler
32. Tip Blight of Arborvitae, Pestalotia funerea Desm.
33. Valsa Canker of Eastern White Pine, Valsa kunzei var. superficialis Waterm.
34. Verticillium Wilt, Verticillium dahliae Kleb.
35. Walnut Anthracnose, Gnomonia leptostyla (Fr.) Ces. & de N.
36. White Mulberry Blight, Pseudomonas mori (Boyer & Lambert) Stevens



STATUS REPORT

FORESTRY DIVISION

INTRODUCTION

Some cynics say that if a person is not happy with the weather in Missouri, they should wait 24 hours and it will change. In our present case, we waited 12 months and the weather changed from extremely dry in 1980, to extremely wet in May, June and July of 1981. For the remainder of the year it was dry in some areas and adequately wet in others. Central Missouri ran short of moisture in late summer, but received generous amounts in October.

A number of insects and diseases created problems from both the foliage loss and work generation standpoint. There were some stressful days when there were not enough hours to answer the many telephone pest related calls. Many trees stressed from the drought in 1980, finally died this summer. The varied growing season this year was responsible for many fungi on trees and shrubs which we normally do not see during prolonged periods of drought.

In this our nineteenth annual Forest Pest Report, we attempt to include pests that have caused aesthetic damage to urban or forest trees. We have reported pests that are a potential problem, endangered the quality of vegetation appearance, or caused log degrade and lumber value loss.

As tree values increase each year, home and forest owners are increasingly more interested in their vigor and condition. Inquiries to the Forest Pest Management group became more numerous each year as tree insect and disease problems increase. We serviced a great variety of inquiries including mushroom identification, insect and disease identification, and spider identification.

Because of adequate rainfall amounts we saw very little of the pine wilt nematode problem on Scotch pine. The looper complex blossomed over much of the state this spring which generated many telephone calls from the public. As predicted, the variable oak leaf caterpillar did complete winter successfully and hatched in late summer. However, in most areas egg parasitism occurred as well as larval mortality due to a fungus. This was spotty, however, and some isolated timbered regions did receive heavy defoliation.

We all perked up when we learned of gypsy moth finds in Missouri and a small infestation near our border in Arkansas.

Disease problems developed in large numbers this summer due to the scattered frequent rainfall in spring and early summer. Conditions were ideal for the development and spread of needle and leaf fungi. Canker problems were serious on both conifer and hardwood trees.

THE PROGRAM

In 1962, a cooperative program, the Forest Pest Control Program, was entered into with the U.S. Forest Service by the Forestry Division, Missouri Department of Conservation. Under the original agreement, this effort is designed to detect, evaluate or appraise, and control forest insects and diseases on state and private land. Department Foresters and other personnel report occurrences of damaging insects, diseases and wild animals. Forest Pest Management specialists coordinate the program.

Drought, diseases and insects cause damage to trees and shrubs which often goes unnoticed until mortality occurs. Scattered tree losses occur on an annual basis in the forest from root rots, vascular diseases, hardwood borers, pine cambial feeders, defoliating insects and drought.

Many kinds of factors produce stresses upon trees. Trees under stress are vulnerable to a host of cankers, root rots and boring insect problems. Some factors that cause trees to stress are drought, compacted soil, root distrubance, lightning strike, lack of nutrients and wet soil conditions to list just a few.

Maintaining tree vigor for the site that it occupies is the most important consideration to insuring a long life.

CONDITIONS IN BRIEF

Early spring, 1981, was rather dry. Middle and late spring and early summer was wet in central Missouri and over the entire state. In late June through September, central Missouri was dry, but adequately moist over the remainder of the state. From October on, adequate rain fell to change the sub soil. Although temperatures during summer were not prolonged over the 100 degree mark, it was very humid and during warm and humid periods, the atmosphere was oppressive. Walnut production was good over the state as was acorn production in the black and red oak group.

The bronze birch borer continued to kill white birches over the state. The pine wood nematode took back seat in 1981 since drought conditions were not serious and Scots pines were not stressed. The looper complex problem was serious in 1981, with extensive hardwood defoliation over the state. The variable oak leaf caterpillar did cause heavy defoliation in scattered areas of the Lake Ozark area. By August, 1981, nine male gypsy moths were trapped in Missouri.

All pests in this report have been observed by our Department Foresters, other Department personnel, Ramon D. Gass, Forest Entomologist, or Dr. Patricia Gowen, Forest Pathologist.

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Gypsy Moth - Nine male moths were trapped in separate traps in St. Louis County, Montgomery County, Boone County, and Jasper County. Personnel of the State Department of Agriculture and the Missouri Department of Conservation, in cooperation with the U.S.D.A., A.P.H.I.S., located and monitored 3,000 traps. The State Department of Agriculture maintained 2,800 traps and were responsible for finding all of the trapped male moths. Other cooperators were Ray Bruns with Union Electric Company in St. Louis, and John Grinstead at Fort Leonard Wood.

Variable Oak Leaf Caterpillar - Defoliated thousands of acres in 21 counties in south Missouri. Defoliation was heavy and scattered.

Looper Complex - Caused heavy defoliation in most of the state during late spring. A number of different species were involved in the outbreak and many hardwood species of trees and shrubs were affected.

True Tree Grasshopper - Caused light defoliation of white oaks in scattered areas in Iron, Reynolds, and Ste. Genevieve Counties.

Eastern Tent Caterpillar - Was heavy where eastern black cherry grows. There were an average of five webs per plant and defoliation was complete.

Fall Webworm - Was reported from a number of counties in 1981, however, webbing and defoliation was light.

European Pine Sawfly - Presence and defoliation was heavy in scattered locations in 1981, on Scots and Mugho pines.

Loblolly and Redheaded Pine Sawflies - Increased in 1981 with defoliation being light to moderate in scattered locations.

Evergreen Bagworm - Occurred statewide on ornamental cedars, but was on the light side.

FOREST DISEASES

Anthracnose - Anthracnose of oak, pecan, walnut, and maple was a widespread problem during late summer.

Brown-Spot Needle Blight - was widespread and severe on Scotch pine in Christmas tree plantations.

Diplodia Tip Blight - was widespread and severe on Austrian pine. Trees more than 30 years old were especially hard-hit.

Dutch Elm Disease - continued to cause widespread mortality of American elm.

Hypoxylon Canker of Oak - was widespread and serious on drought-stressed oaks. The occurrence of Hypoxylon spp. usually coincided with occurrence of the two-lined chestnut borer.

Maple Decline - this disease continues to increase in severity in urban areas.

Naemacyclus Needle Cast - was widespread and serious during late summer and fall. The disease was especially severe on Scotch pine in Christmas tree plantations.

Oak Wilt - was not a serious problem during the summer of 1981.

Pine Wilt Disease - was not a serious problem during the summer of 1981.

Rhizosphaera Needle Cast - continued to be a problem of blue spruce. The disease was less serious in 1981 than 1980.

Sycamore Anthracnose - was widespread in 1981, but was not as damaging as in 1980.

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PROJECTS

The enthusiastic team effort of the Forestry Division staff specialists and Department foresters resulted in a well coordinated, successful Forest Pest Management Program again during 1981. Over 2,000 forest and shade tree requests were serviced statewide in 1981. Staff specialists were available to all who sought their assistance. In May and early June, eight regional Pest Management sessions were held for all Department foresters and personnel from other forestry related agencies. A total of 82 people attended these one-day meetings. Staff specialists serviced over 1,000 pest-related telephone calls. Over 800 diagnoses were made for the state. Periodic visits to various Natural Areas, or to the George O. White State Forest Nursery revealed no serious pest problems.

Gass and Gowen conducted detection and evaluation surveys on the major insect and disease problems in 1981, on 7,600,000 acres. Reports were prepared and submitted to the U.S. Forest Service.

A total of six Forest Insect and Disease Status Reports (April through September) were prepared and sent to all Missouri Christmas Tree Producers, most Department personnel, and other individuals, totaling 800 copies per month.

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HARDWOOD DEFOLIATORS AND BORERS

Gypsy Moth - During this summer of 1981, the gypsy moth defoliated over 11 million acres in the northeast. Closer to home, trappers captured 9 single male moths; one near Columbia, one in Montgomery County, one in Jasper County near Joplin, one near Kansas City, and five in the St. Louis area. More alarming was the discovery of an infestation north of Hardy, Arkansas, only nine miles from Missouri's state line.

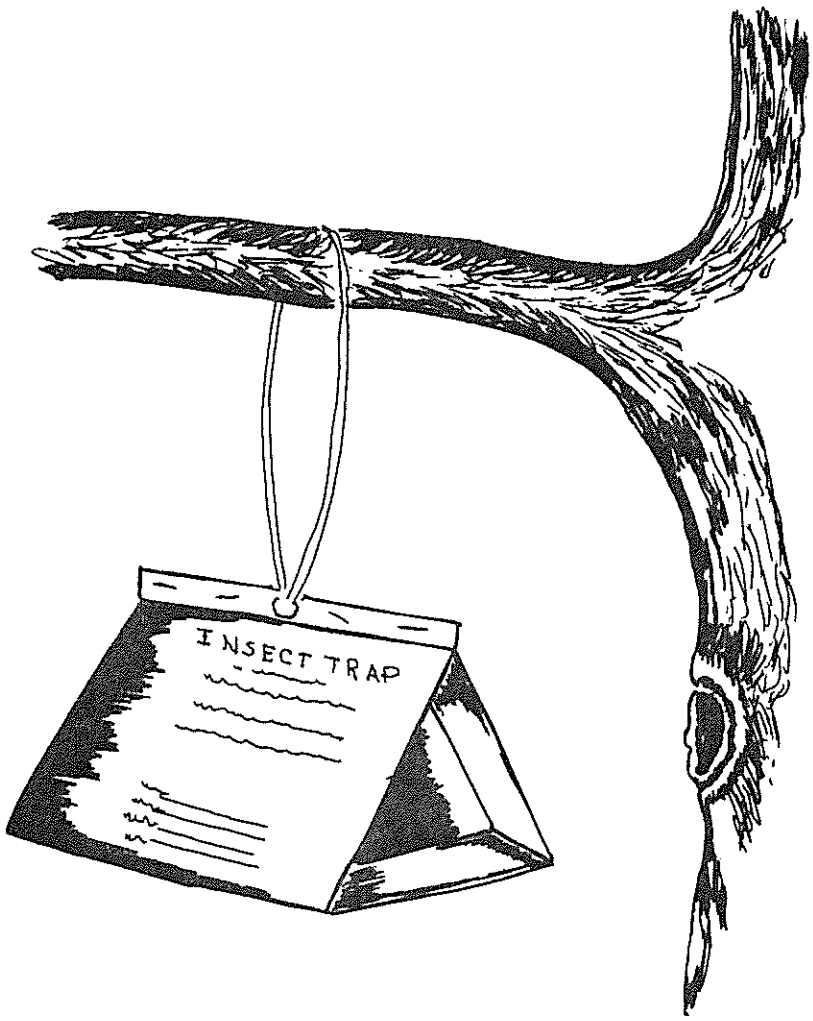

Figure 1. Gypsy Moth Trap

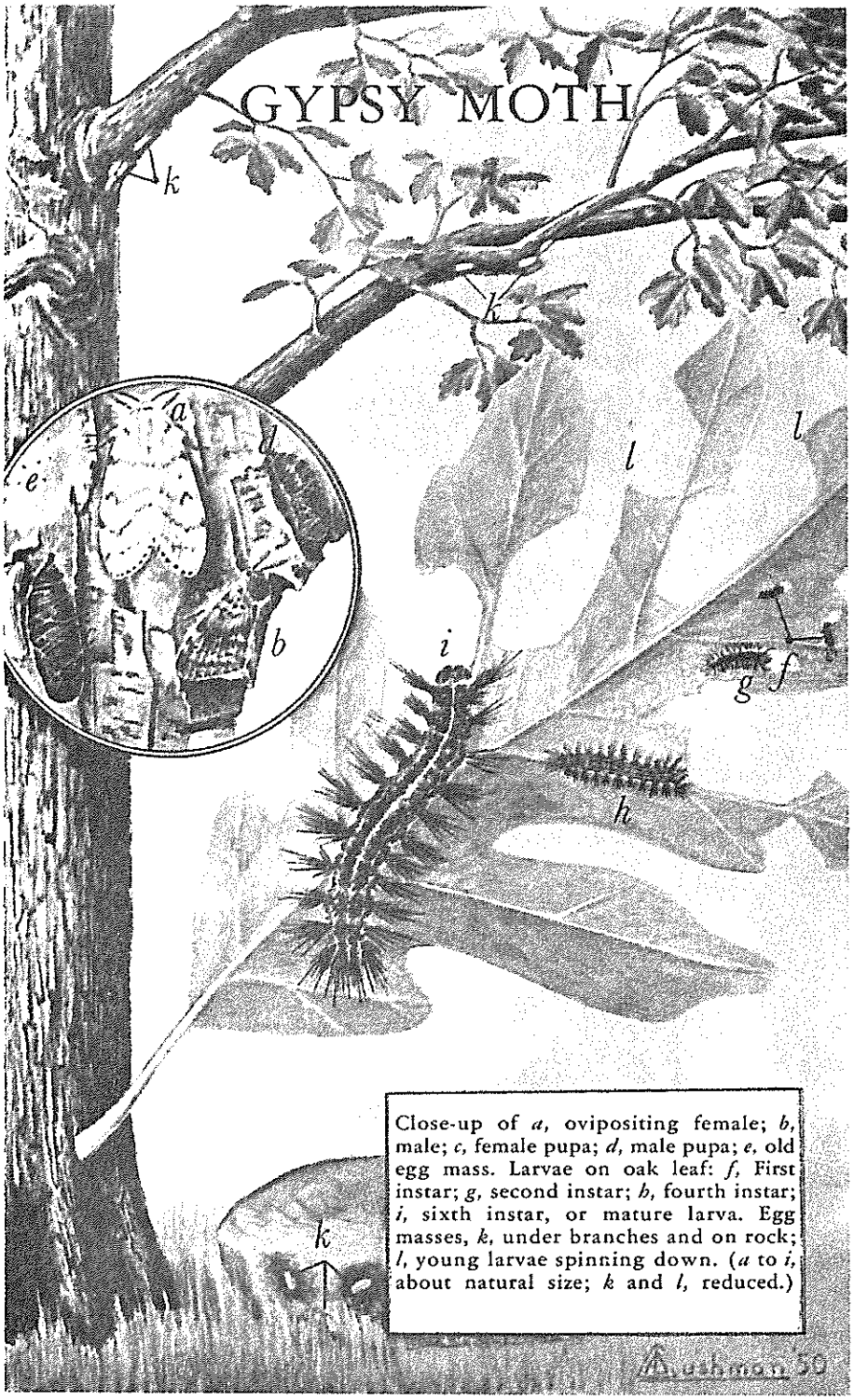
GYPSY MOTH
Close-up of a, ovipositing female; b, male; c, female pupa; d, male pupa; e, old egg mass. Larvae on oak leaf: f, First instar; g, second instar; h, fourth instar; i, sixth instar, or mature larva. Egg masses, k, under branches and on rock; l, young larvae spinning down. (a to i, about natural size; k and l, reduced.)

Figure 2. Life Stages of the Gypsy Moth

The life cycle of the gypsy moth parallels that of a number of other insects. The gypsy moth is not native to the United States. Larvae feed on a great variety of hardwood foliage in spring and early summer. With three repeated defoliations, hardwood trees can die. One defoliation can kill evergreen trees.

Gypsy moths overwinter in the egg stage in masses on bark, rocks, litter, or on man-made objects.

BN-33676

Egg masses on tree.

Figure 3. Gypsy Moth Egg Masses

The Looper Complex - Problem of 1980, expanded and intensified in 1981. A variety of hardwood species were heavily defoliated over a large portion of the state. Spring and early summer was the time of heavy defoliation on the one hand by a variety of leaf feeding caterpillars. On the other,hordes of large green Calosoma beetles were attracted to the leaf feeding caterpillars and also to bright lights on parking lots of shopping centers. Both phenomena were a nuisance and frightened many people who didn't know what this association meant.

The presence of the loopers and Calosoma beetles resulted in hundreds of telephone calls to our District Forest offices over the state. Some of these defoliators were the elm spanworm, spring cankerworm, Linden looper, oak leaf tiers, and oak leaf rollers.

Trend - At this point it is difficult to make a predicition for 1982. Calosoma beetle numbers could have been sufficient in 1981 to reduce the number of defoliators, or however, we could have heavy defoliation again.

Suppression - No control was conducted on a forest wide scale.

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Variable Oak Leaf Caterpillar - Occurred in 21 counties in south Missouri. Defoliation was light to heavy in scattered areas. In certain areas, egg parasitism by the Telenomus wasp was moderate to heavy. This was responsible for a considerable reduction in population of the variable oak leaf caterpillar. In some of these same areas a fungus developed in the feeding caterpillars, causing them to die very quickly. Thus, the earlier predictions of heavy defoliation were correct, however, natural factors interferred with the caterpillars overall completion of feeding.

Trend - According to the present situation in scattered populations of light and heavy numbers of overwintering caterpillars, defoliation will vary in different locations. If no egg parasitism occurs, or no fungus builds in the population, defoliation will be scattered and occur in moderate to heavy degrees.

Suppression - No control work was required during 1981.

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Fall Webworm - was present this year in southwest Missouri causing light to moderate defoliation. No serious defoliation occurred anywhere in the state. Where the insect was present it occurred on walnut, persimmon, hickory, sycamore and several other species.

Trend - light to moderate webbing could occur in 1982.

Suppression - individual web control was conducted by owners of shade trees and nut orchards.

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The Walnut Caterpillar and other related Datana sp. insects occurred in large numbers over the state in 1981. The walnut caterpillar infested walnuts and hickories while other Datanas fed upon foliage of sumac and post, black and red oaks over the state. This defoliation of isolated, single saplings along roadsides was very conspicuous.

Trend - populations in 1982 should be larger than in 1981.

Suppression - a number of nut growers sprayed their trees to prevent defoliation.

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True Tree Grasshopper - defoliated white oaks in the Iron and Reynolds Counties. Defoliation was light to moderate and was scattered over the entire infested range.

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HARDWOOD BORERS

The Carpenterworm, Red Oak Borer and other living tree hardwood borers, as a part of our natural entomological heritage, continue to infest hardwood trees in forested areas of the state. Hardwood borers are also a major problem on many hardwood trees in the urban scene.

Trend - infestation will continue to occur in trees on poor sites. Estimated dollar loss to hardwood borer degrade exceeds $1,000,000.00 annually.

Suppression - stand conversion, selection tree harvest and sanitation harvest was conducted in various timber sales over the state. Some shade tree owners controlled borers in high value trees over the state.

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The Bronze Birch Borer - continues to eliminate many white birch over the state. Past drought conditions predisposed most trees causing them to be susceptible to attacks from the Bronze Birch Borers. This insect, like its relatives, tends to be a secondary attacker and will attack trees in a weakened, declining condition. The larvae develops between the bark and wood, producing a girdling effect on the tree, thus killing it.

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The Two-Lined Chestnut Borer - a close relative to the Bronze Birch Borer, typically attacks weakened oak in south Missouri where moisture stress is a problem. For the last two or three years, moisture was a limiting factor to tree growth that triggered attacks by the Two-lined Chestnut Borer. Late frost damage and droughty sites were also partially responsible for oak and hickory mortality.

Trend - most Ozark soils tend to have droughty characteristics. As long as precipitation is deficient in forested areas, and as a result trees are predisposed, the Two-lined Chestnut Borer and, on ornamental white birch, the bronze birch borer will continue to infest affected trees and kill them.

Suppression - drought hazard sites should be identified and the stand manipulated accordingly. Special management prescriptions should be used on droughty areas or hardwood sites with shallow soil and a hardpan. In some cases, even-aged management in hardwoods may be in order while other areas may best be clear-cut and converted to shortleaf pine in its natural range.

The selection system could be used to reduce basal area, favoring the more drought tolerant species, using a shorter rotation. It may be desirable to grow a normal basal area volume per acre and use the entomological and pathological rotation.

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The Cottonwood Twig Borer, Cottonwood Borer, Cottonwood Leaf Beetle and Poplar Tent Maker - continue to infest cottonwood where it grows. Borer damage is greater on trees growing on poorer sites. Defoliation by the poplar tent maker occurs almost everywhere on cottonwood.

Trend - no increase in infestation is anticipated in 1982.

Suppression - No control was conducted for any of these pests in 1981.

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Pine Trunk Borers, Twig Borers and Defoliators

Nantucket Pine Tip Moth - and related species. Populations were very light again in 1981. Scattered shortleaf pine plantings out of the natural range were light to moderately infested by the third generation in late summer.

Trend - depending upon winter weather conditions, 1982 populations will probably be low to moderate.

Suppression - no practical chemical controls are available to plantation owners.

Black Turpentine Beetle - infested shortleaf pine in five counties in 1981. Lightning struck and drought predisposed trees attracted beetles in several cases. Single trees were infested and statewide infestation was endemic.

Trend - light infestations are anticipated where shortleaf pine have been disturbed or are in a weakened condition.

Suppression - where infestations occur, recommendations are to fell trees and either salvage or burn.

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Pales Weevil - infested Scotch pine Christmas trees in two counties in 1981. Damage was very light and much less than in 1980. Very small amount of flagging occurred and was no cause for concern by growers.

Trend - this insect will continue to infest scattered plantations where cultural and chemical controls are not employed.

Suppression - some producers continue to treat their stumps with chemicals to discourage egg laying.

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White Pine Aphid - infested Eastern white pine in numerous counties in 1981. Colonies were numerous and large on many ornamental trees. Other species of aphids occurred on hardwood species in certain areas of the state. Very little damage resulted from sap feeding on white pine.

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Pine and Cedar Defoliators

European Pine Sawfly - infested Scotch pine in plantations and ornamental plantings in twenty-one counties in 1981. Infestations ranged from light to heavy causing substantial defoliation which required treatment.

Trend - populations will remain at about the same level in 1982 as in 1981.

Suppression - a number of growers with the problem spray their trees.

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The Loblolly Pine Sawfly - occurred in seven counties in south Missouri in 1981. Defoliation of shortleaf pine was light to moderate, but was very scattered on individual trees.

Trend - populations will build in 1982.

Suppression - where small ornamental pines were affected, owners handpicked colonies.

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Redheaded Pine Sawfly - was present in 19 counties on shortleaf pine in south Missouri. Defoliation was moderate in most areas, but rather extensive in several others. This defoliation occurred on planted shortleaf pine.

Trend - populations will increase in 1982.

Suppression - limited control work was conducted on plantings around Department tower sites. Some owners controlled individual colonies on their ornamentals.

Evergreen Bagworm - populations were moderate on pfitzer evergreens and other susceptible evergreens around the state. Defoliation was not as noticeable in 1981, as in previous years.

Trend - moderate defoliation will occur in 1982, wherever ornamental evergreens grow.

Suppression - many owners with evergreens had them sprayed or hand-picked the bags.

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FOREST AND ORNAMENTAL TREE DISEASES

Brown-Spot Needle Blight - this disease was widespread and severe on Scotch pine during 1981. Several Christmas tree plantations were badly damaged. Some Austrian pine were also affected.

Trend - Brown-spot needle blight will continue to be a problem in Missouri, especially on Scotch pine in Christmas tree plantations.

Suppression - control is achieved by spraying twice in the spring: once when needles are half-grown and again 3 to 4 weeks later (Bordeaux mixture 8-8-100, and products containing chlorothalonil such as Bravo and Daconil are effective fungicides).

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Diplodia Tip Blight - in 1981, Diplodia tip blight was widespread and severe on Austrian pine, with trees more than 30 years old being the most heavily damaged. The disease also caused twig and branch mortality of Eastern white and Scotch pine, and caused the death of a stand of 25-year-old red pine in Camden County.

Trend - due to an abundance of moisture during the spring, Diplodia tip blight was extremely severe in 1981. With the current high level of inoculum available for infection, the disease should continue to be an important pine problem for the next several years.

Suppression - control of the disease involves removing infected branches and cones during dry weather, and spraying with Bordeaux mixture at bud break and again 2 weeks after bud break.

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Oak Wilt - only scattered cases of oak wilt were found in 1981. It appears that the extremely hot summer of 1980 served to destroy much of the Ceratocystis fagacearum inoculum. Across Missouri, many drought-stressed oaks exhibited dieback because of the combined effects of the two-lined chestnut borer (Agrilus bilineatus (Web.)) and Hypoxylon spp. Oaks exhibiting dieback were often assumed, mistakenly, to have oak wilt.

Trend - It may take years for Ceratocystis fagacearum to rebuild to damaging levels in Missouri's forests. In urban areas, the fungus will probably continue to cause occasional losses.

Suppression - sanitation is the most effective and practical control procedure at the present time.

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Naemacyclus Needle Cast - during September and October, Naemacyclus needle cast emerged as an important problem of Scotch pine across the state. Several Christmas tree plantations were especially hard-hit. Symptoms and signs of Naemacyclus needle cast were also observed on jack, shortleaf, and Virginia pine growing in association with infected Scotch pine.

Trend - Naemacyclus Needle Cast will probably become an increasingly important problem during the next several years.

Suppression - control of the disease involves removing heavily infected trees, and spraying with a conifer fungicide (such as Manzate D) in mid-April, early May, and June 1. If there is a warm and rainy fall, spraying during mid-October, November 1, and mid-November should improve control.

* * * * * * * * * * * *

Pine Wilt Disease - the only new report of pine wilt disease concerned the recovery of Bursaphelenchus xylophilus (formerly Bursaphelenchus lignicolus) from Virginia pine in Carter County. In addition to Virginia pine; Eastern white, Austrian, Scotch, and mugho pine in Missouri are also susceptible to the disease. Pine wilt disease was not a serious problem in 1981, probably due to wet spring and summer conditions.

Trend - pine wilt disease is endemic in Missouri. Drought conditions seem to increase disease severity. In the future, mortality will depend on weather conditions and the number of beetle vectors.

Suppression - removal and destruction of diseased pines is the most practical and effective means of control, at this time.

* * * * * * * * * * * *

Rhizosphaera Needle Cast - Rhizosphaera needle cast appears to be widespread in the state, causing damage to ornamental blue spruce. The disease appeared to be less severe in 1981 than 1980.

Trend - Rhizosphaera needle cast will continue to be a problem of blue spruce especially in urban areas. Disease severity will depend on weather conditions and the amount of inoculum.

Suppression - control consists of spraying infected trees with Bordeaux mixture 8-8-100 or fungicides containing chlorothalonil (such as Bravo or Daconil) during early June and once again in early July.

Sycamore Anthracnose - this disease is widespread in Missouri, affecting both urban and forest trees. Sycamore anthracnose was not as severe in 1981 as 1980.

Trend - Sycamore anthracnose is endemic in Missouri. Disease severity will depend on weather conditions - cool and wet spring weather favors infection.

Suppression - control of the disease in the forest is not practical. Individual trees infected with sycamore anthracnose can be treated with fungicide sprays (Bordeaux mixture, maneb, or zineb). The first fungicide application should be made just prior to bud break, the second two weeks after the first, and the third when the leaves have attained one-half of their mature size. A late fall spray may increase control of anthracnose.

* * * * * * * * * * * *

CONCLUSION

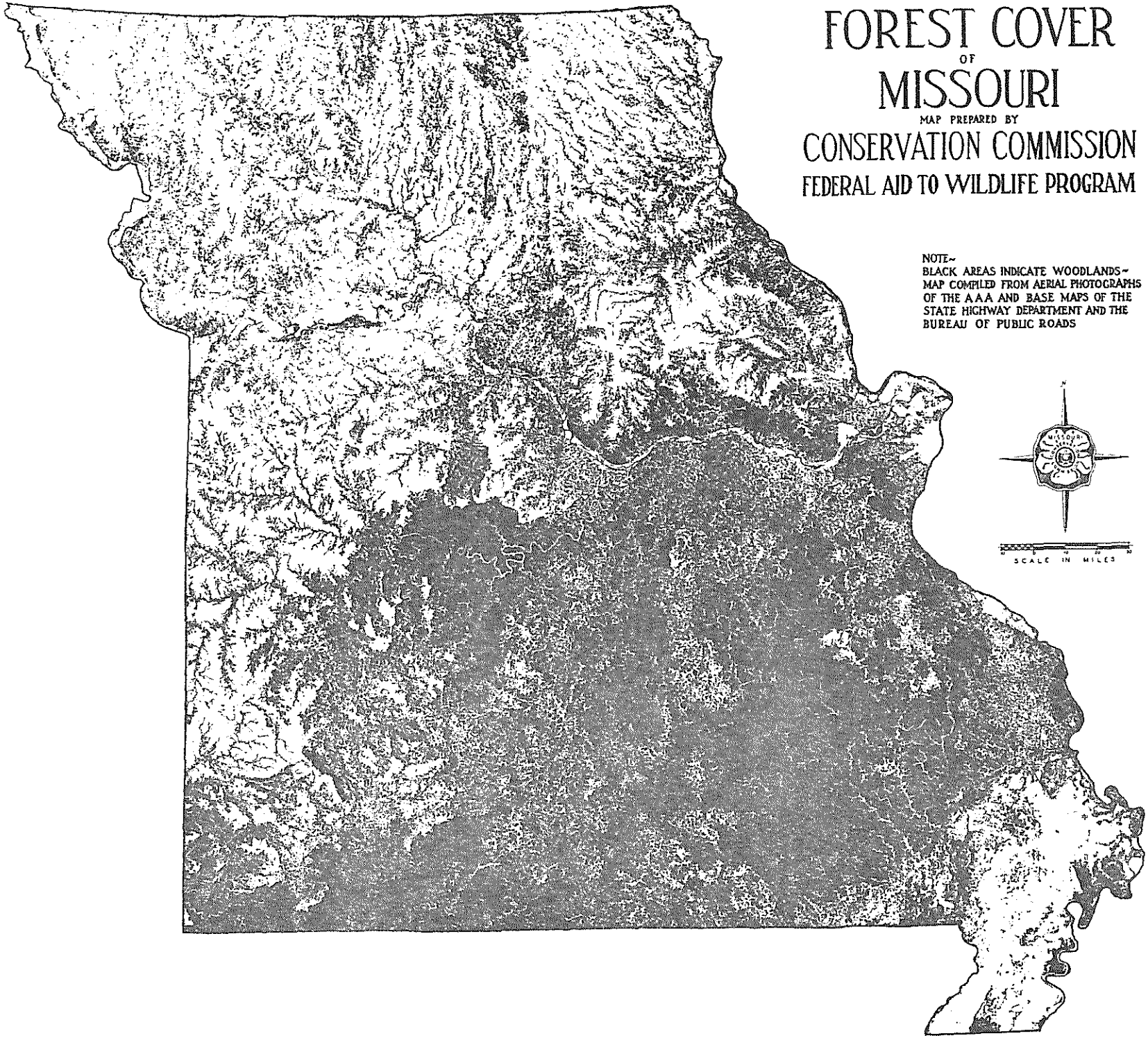
The looper complex, Diplodia blight, the variable oak leaf caterpillar, Datana defoliation and Naemacyclus needle cast, brown-spot needle blight, and hardwood anthracnose were the most outstanding problems during 1981.

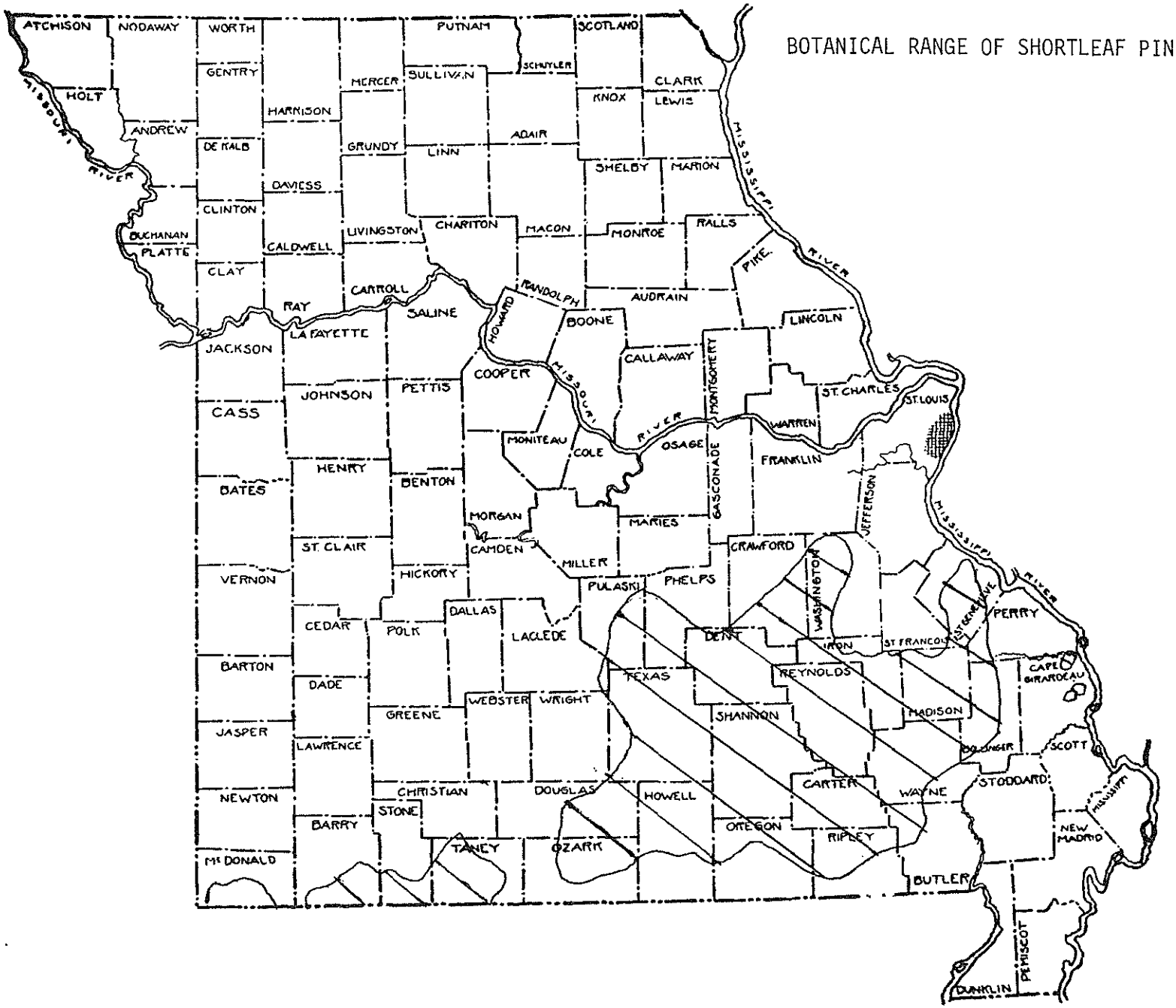
Although the spring and early summer of 1981 experienced above normal rainfall, it did turn dry in late summer and autumn,especially in central Missouri. Problems with the pine wood nematode in 1980 did not develop in 1981, probably due to the adequate moisture.

We were busy informing the public of pest conditions and of the potential devastating effects of the gypsy moth. In that regard, the National Gypsy Moth Review Meeting was attended in New Jersey by the Forest Entomologist to learn of its development in the northeast.

We contacted the public by radio as well as personal contacts. The most significant and personally rewarding of all activities was working with people and providing service to all who sought answers to their pest problems. We duly acknowledge the assistance of our foresters who submitted reports and observations about pests on their district.

This cooperation is the key to our successful Forest Pest Management program.


FOREST COVER
OF
MISSOURI
MAP PREPARED BY
CONSERVATION COMMISSION
FEDERAL AID TO WILDLIFE PROGRAM
NOTE~
BLACK AREAS INDICATE WOODLANDS~
MAP COMPILED FROM AERIAL PHOTOGRAPHS
OF THE AAA AND BASE MAPS OF THE
STATE HIGHWAY DEPARTMENT AND THE
BUREAU OF PUBLIC ROADS
SCALE IN MILES


BOTANICAL RANGE OF SHORTLEAF PINE
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SCHUYLER
CLARK
HOLT
MERCER
SULLIVAN
KNOX
LEWIS
HARRISON
ANDREW
ADAIR
DE KALB
GRUNDY
LINN
SHELBY
MARION
DAVIESS
CLINTON
LIVINGSTON
CHARITON
MACON
MONROE
RALLS
BUCHANAN
PLATTE
CALDWELL
CLAY
CARROLL
RANDOLPH
AUDRAIN
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CASS
MONITEAU
COLE
OSAGE
WARREN
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BENTON
BATES
MORGAN
MARIES
GASCONADE
JEFFERSON
CAMDEN
CRAWFORD
ST. CLAIR
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REYNOLDS
CAPE GIRARDEAU
DADE
WEBSTER
WRIGHT
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MADISON
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BOLLINGER
SCOTT
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DOUGLAS
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OREGON
RIPLEY
NEW MADRID
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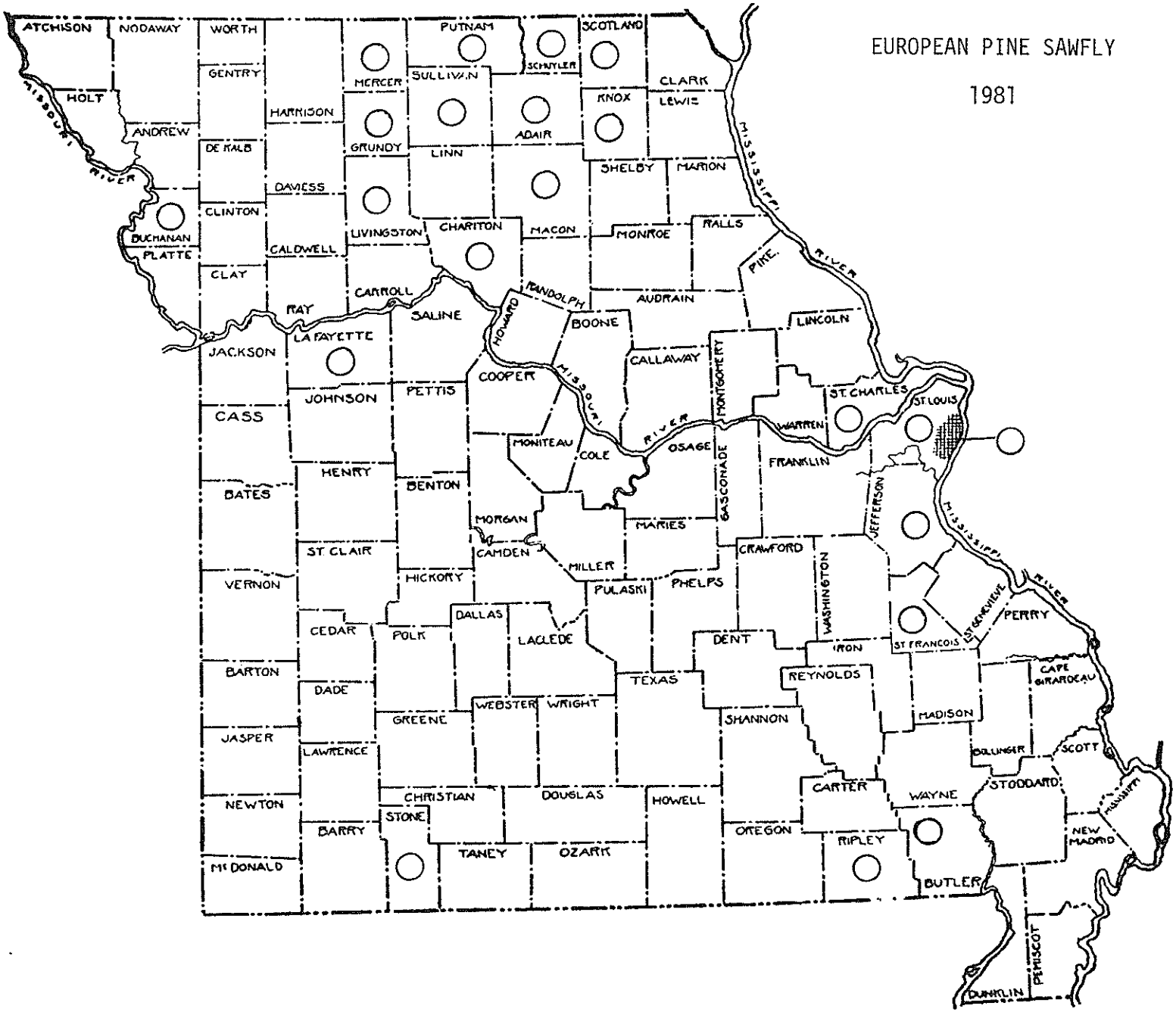
TANEY
OZARK
Mc DONALD
BUTLER
DUNKLIN
PEMISCOT
MISSOURI RIVER
MISSISSIPPI RIVER


EUROPEAN PINE SAWFLY
1981
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
SCHUYLER
CLARK
LEWIS
KNOX
MERCER
SULLIVAN
GENTRY
HOLT
HARRISON
ANDREW
GRUNDY
LINN
ADAIR
SHELBY
MARION
DE KALB
DAVIESS
CLINTON
LIVINGSTON
CHARITON
MACON
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BUCHANAN
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CALLAWAY
MONTGOMERY
COOPER
MISSOURI RIVER
ST CHARLES
ST LOUIS
JOHNSON
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CASS
MONITEAU
COLE
OSAGE
WARREN
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BATES
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MARIES
GASCONADE
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MILLER
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REYNOLDS
CAPE GIRARDEAU
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WEBSTER
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MADISON
JASPER
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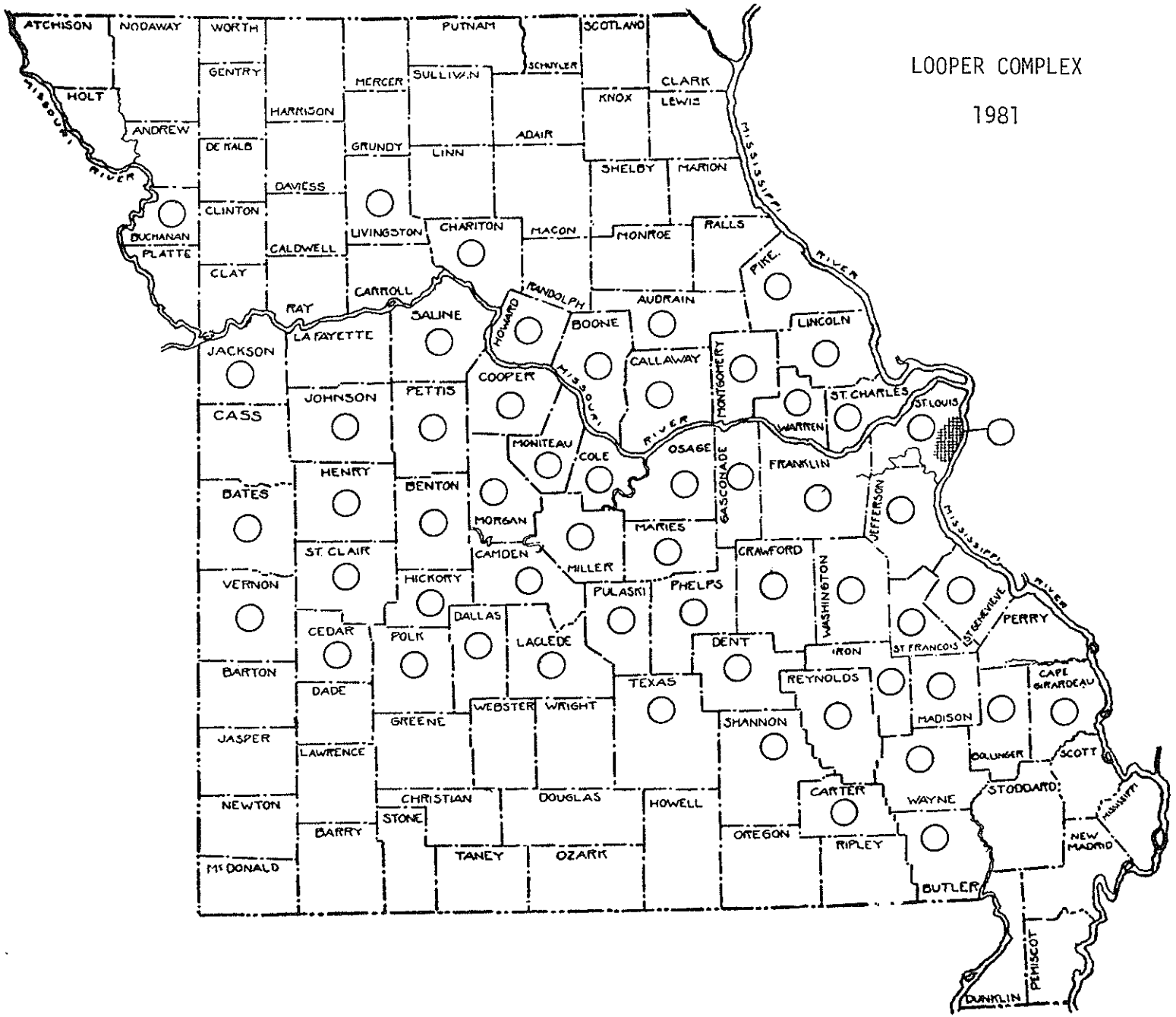
OZARK
McDONALD
BUTLER
DUNKLIN


LOOPER COMPLEX
1981
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SCHUYLER
CLARK
MERCER
SULLIVAN
KNOX
LEWIS
HOLT
HARRISON
ANDREW
ADAIR
DE KALB
GRUNDY
LINN
SHELBY
MARION
DAVIESS
CLINTON
LIVINGSTON
CHARITON
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CARROLL
RANDOLPH
AUDRAIN
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LAFAYETTE
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MONITEAU
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PERRY
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HOWELL
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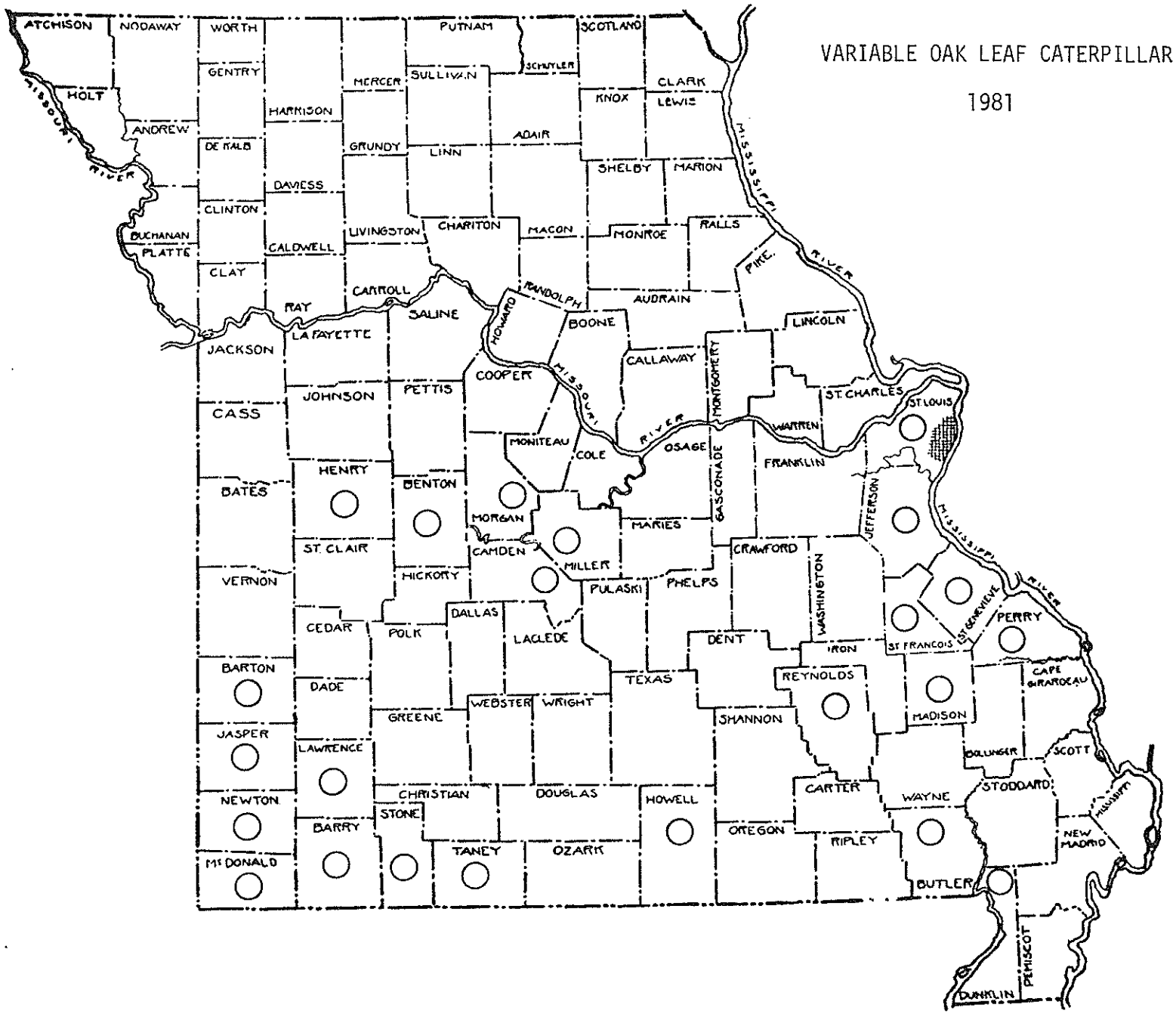
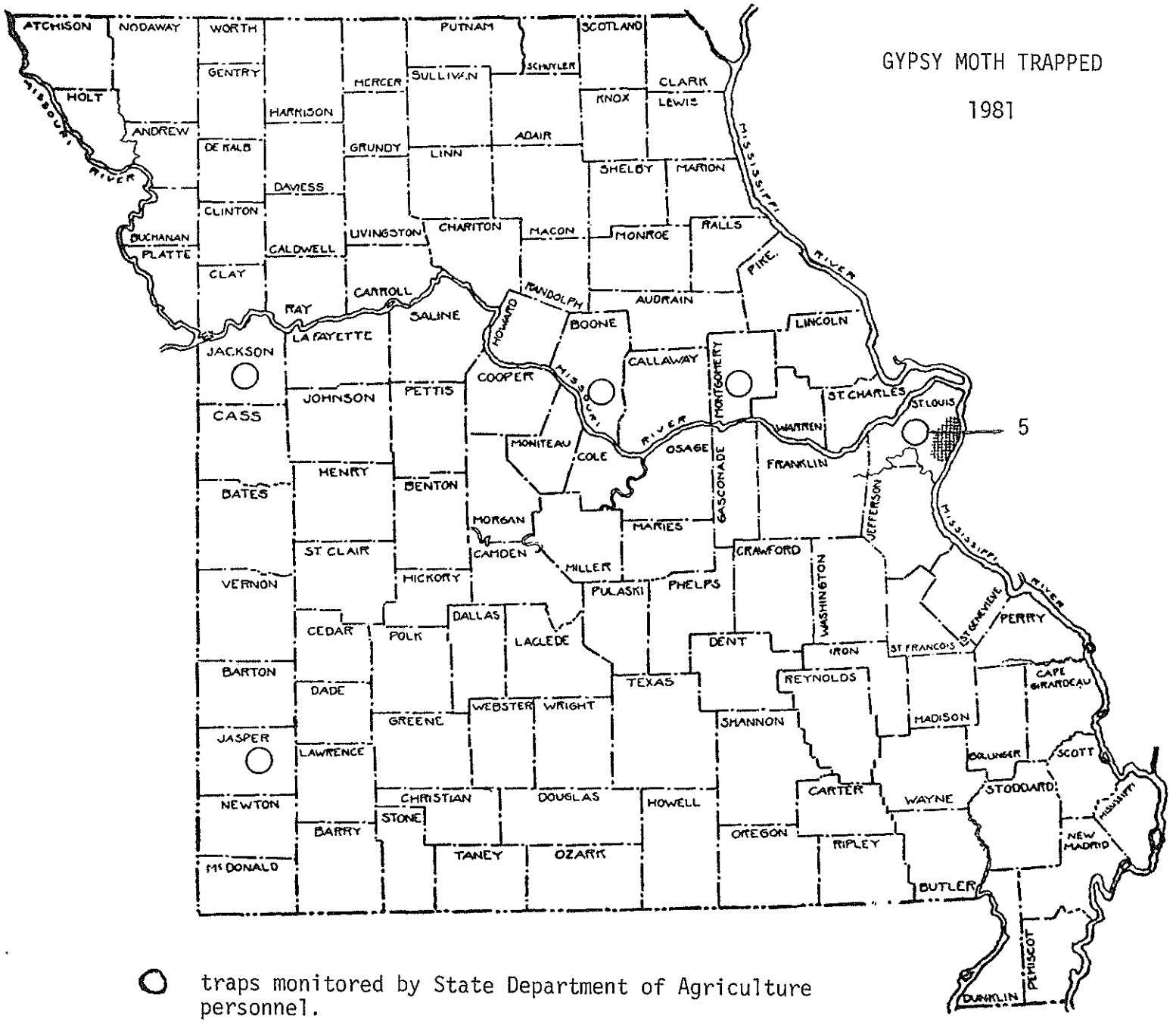
NEW MADRID
BARRY
OREGON
RIPLEY
TANEY
OZARK
McDONALD
BUTLER
DUNKLIN
PEMISCOT
MISSOURI RIVER
MISSISSIPPI RIVER

VARIABLE OAK LEAF CATERPILLAR

1981





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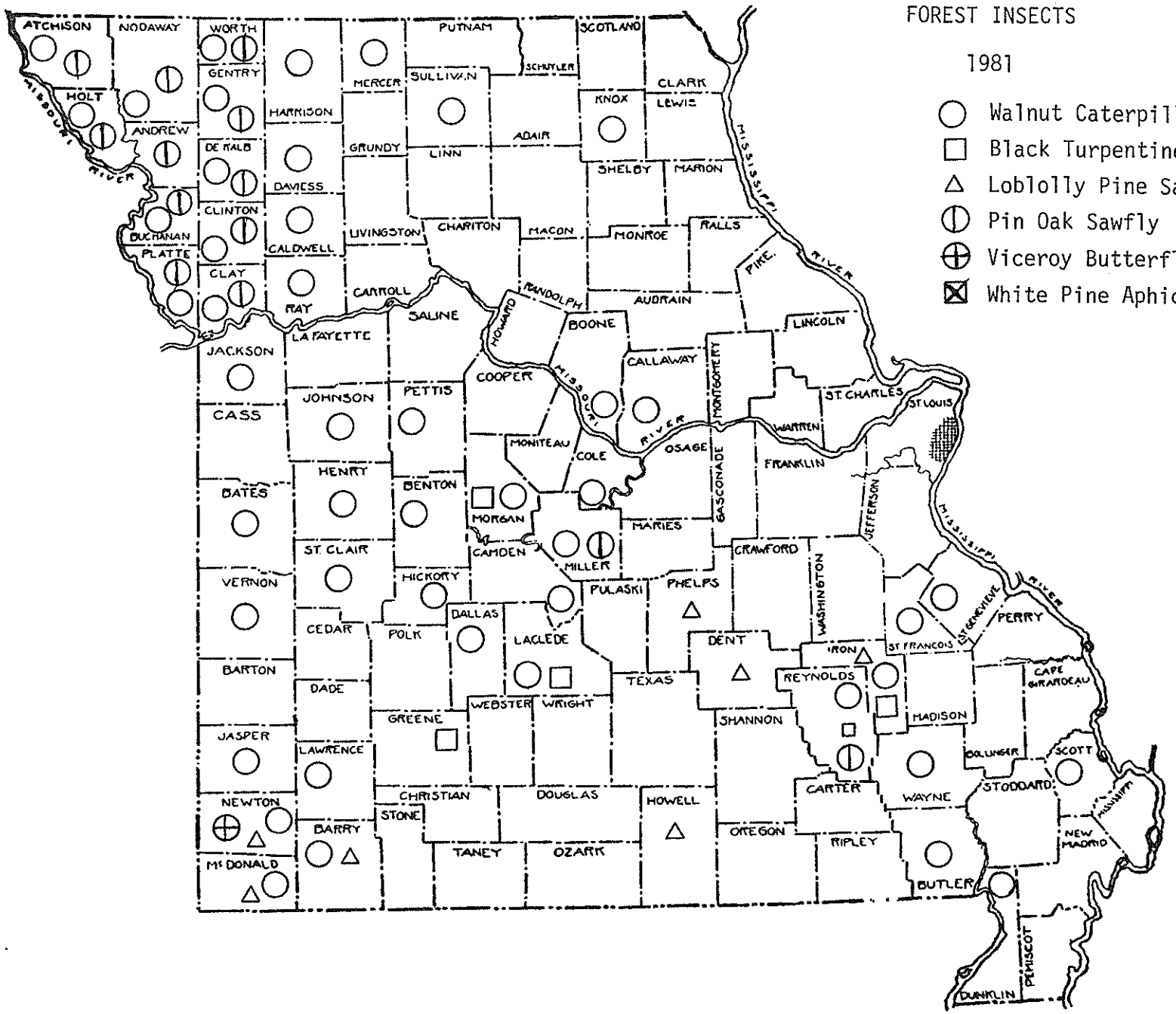
FOREST INSECTS
1981
Walnut Caterpillar
Black Turpentine Beetle
Loblolly Pine Sawfly
Pin Oak Sawfly
Viceroy Butterfly
White Pine Aphid - Statewide
ATCHISON
NODAWAY
WORTH
GENTRY
HOLT
ANDREW
DE KALB
DAVIESS
CLINTON
DUCHANAN
PLATTE
CLAY
RAY
CALDWELL
HARRISON
MERCER
PUTNAM
SULLIVAN
SCHUYLER
SCOTLAND
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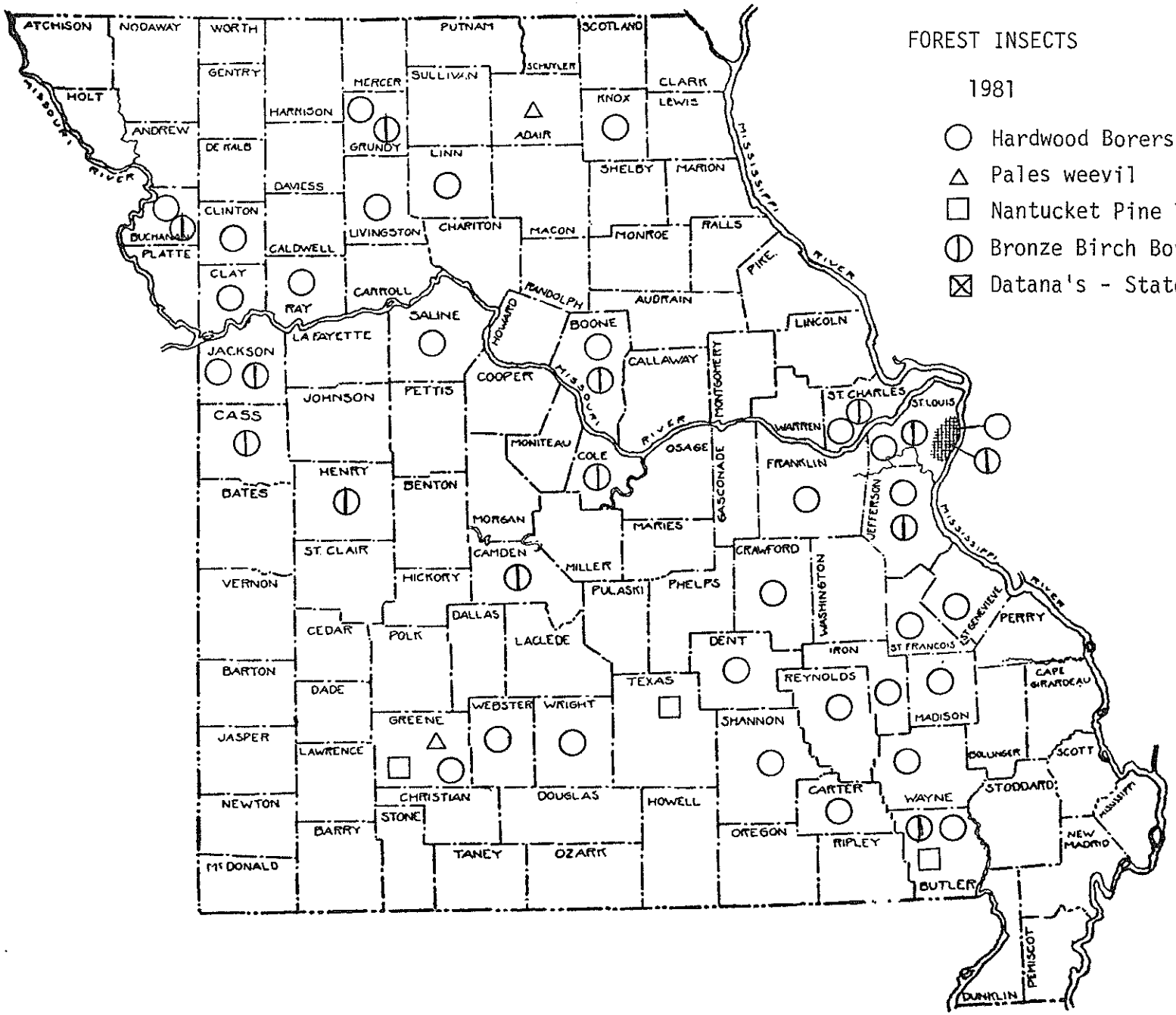
PEMISCOT


FOREST INSECTS
1981
Hardwood Borers
Pales weevil
Nantucket Pine Tip Moth
Bronze Birch Borer
Datana's - Statewide
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SCHUYLER
CLARK
HOLT
MERCER
SULLIVAN
KNOX
LEWIS
HARRISON
ANDREW
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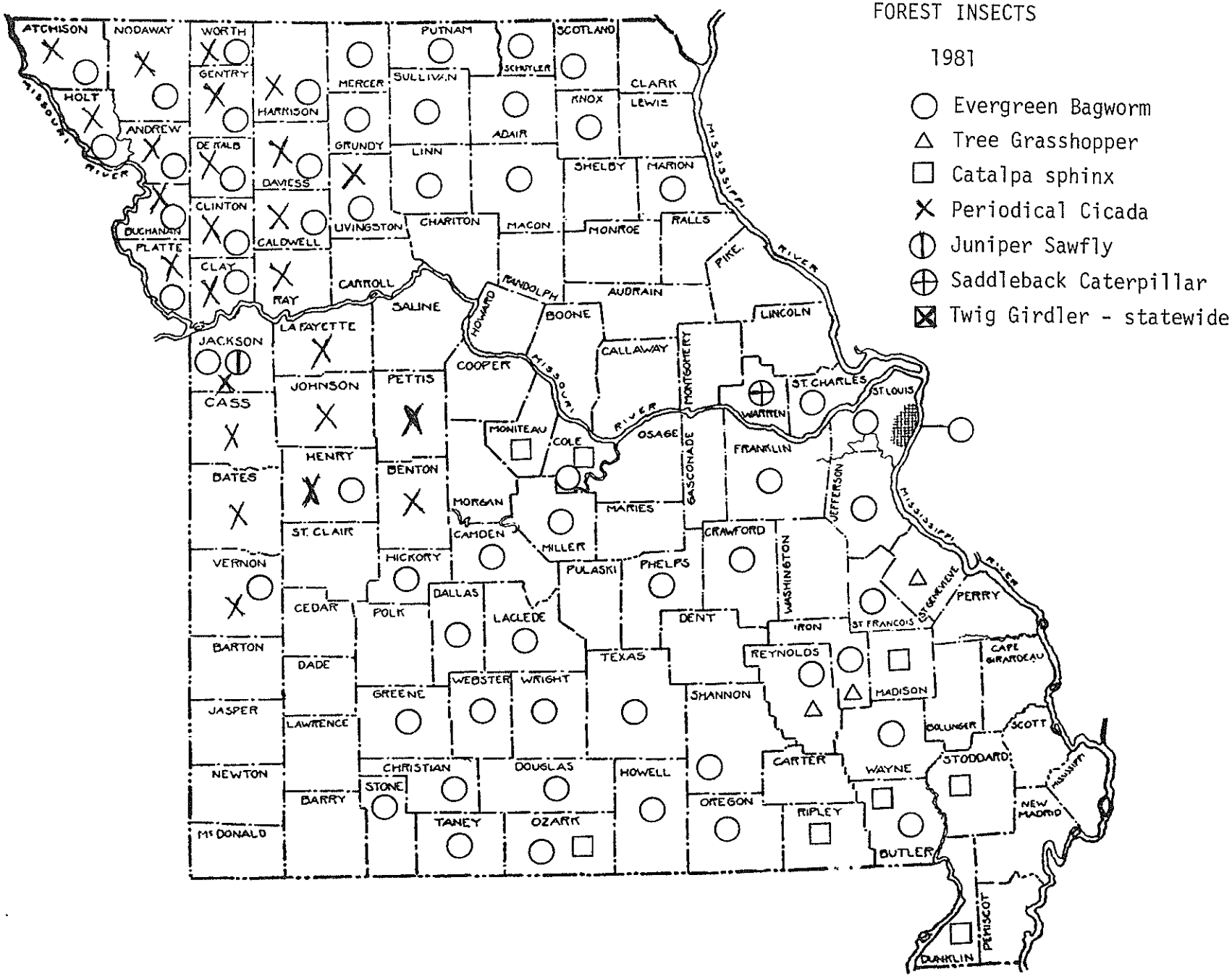
DOUGLAS
HOWELL
NEWTON
STONE
OREGON
RIPLEY
NEW MADRID
BARRY
TANEY
OZARK
McDONALD
BUTLER
DUNKLIN
PEMISCOT
MISSOURI RIVER
MISSISSIPPI RIVER


FOREST INSECTS
1981
Evergreen Bagworm
Tree Grasshopper
Catalpa sphinx
Periodical Cicada
Juniper Sawfly
Saddleback Caterpillar
Twig Girdler - statewide
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SCHUYLER
CLARK
HOLT
MERCER
SULLIVAN
KNOX
LEWIS
HARRISON
ANDREW
GRUNDY
LINN
ADAIR
DE KALB
DAVIESS
SHELBY
MARION
CLINTON
LIVINGSTON
CHARITON
MACON
MONROE
RALLS
BUCHANAN
CALDWELL
PLATTE
CLAY
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CARROLL
RANDOLPH
AUDRAIN
PIKE
SALINE
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CALLAWAY
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PETTIS
MONTGOMERY
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CRAWFORD
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PULASKI
PHELPS
WASHINGTON
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DALLAS
LACLEDE
DENT
IRON
ST. FRANCOIS
STE. GENEVIEVE
BARTON
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TEXAS
REYNOLDS
CAPE GIRARDEAU
WEBSTER
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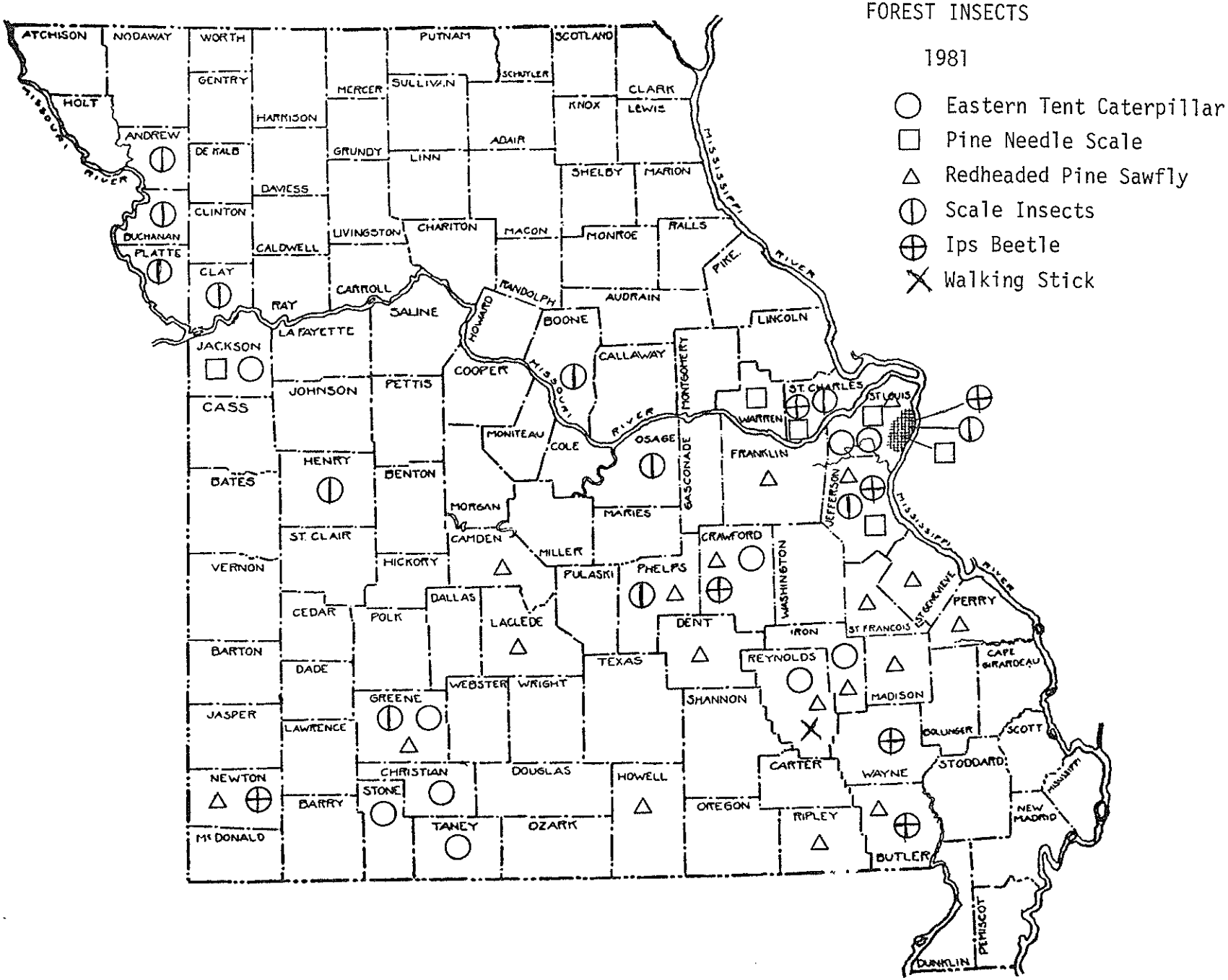
NEWTON
STONE
BARRY
OREGON
RIPLEY
NEW MADRID
TANEY
OZARK
BUTLER
Mc DONALD
DUNKLIN
PEMISCOT


FOREST INSECTS
1981
Eastern Tent Caterpillar
Pine Needle Scale
Redheaded Pine Sawfly
Scale Insects
Ips Beetle
Walking Stick
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SULLIVAN
SCHUYLER
CLARK
KNOX
LEWIS
HOLT
MERCER
HARRISON
ANDREW
DE KALB
GRUNDY
LINN
ADAIR
SHELBY
MARION
DAVIESS
CLINTON
BUCHANAN
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CALDWELL
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CARROLL
RANDOLPH
AUDRAIN
PIKE
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SALINE
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MONTGOMERY
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MONITEAU
COLE
OSAGE
FRANKLIN
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REYNOLDS
CAPE GIRARDEAU
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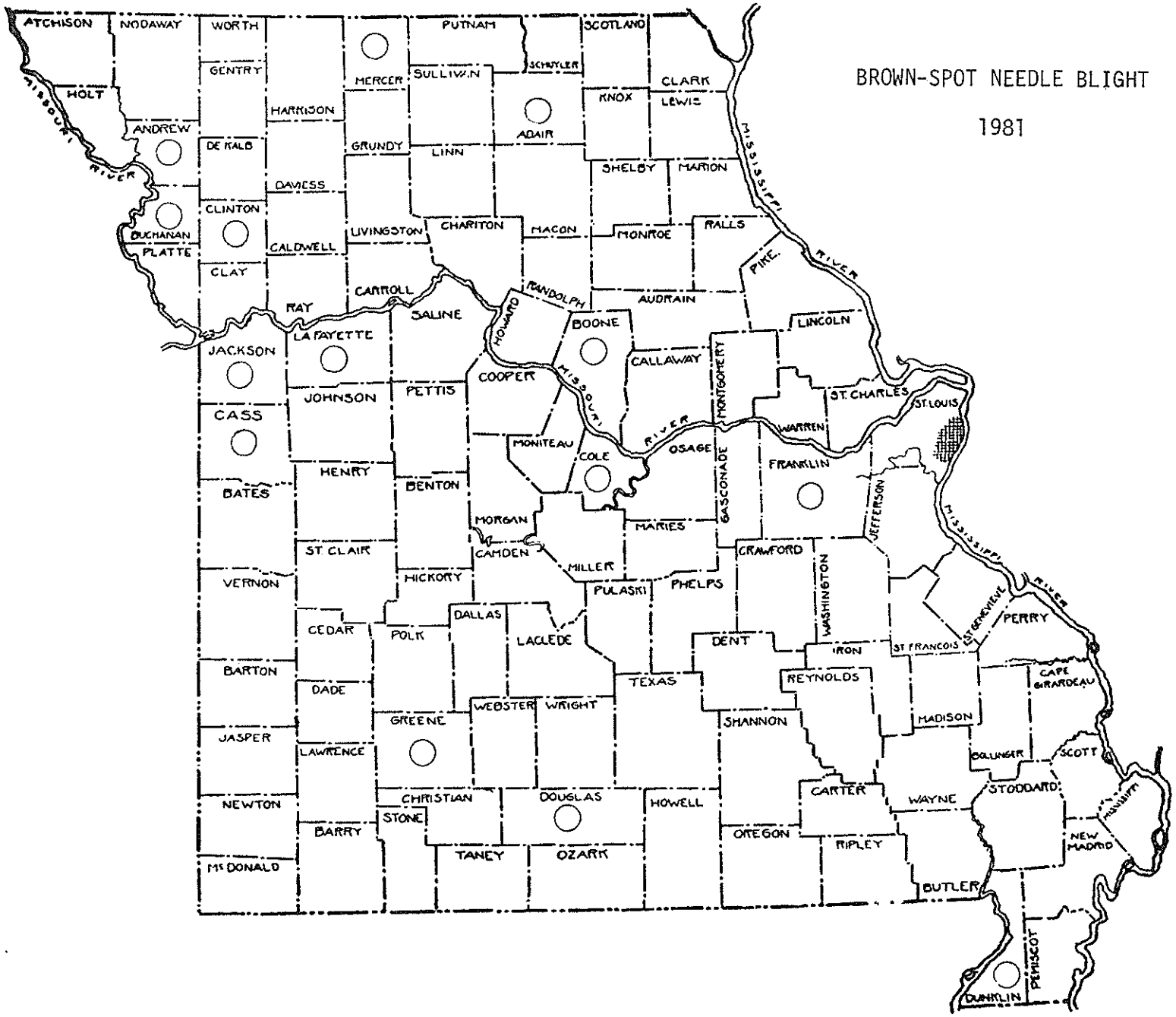
NEWTON
CHRISTIAN
STONE
BARRY
OREGON
STODDARD
MISSISSIPPI
NEW MADRID
TANEY
OZARK
RIPLEY
Mc DONALD
BUTLER
PEMISCOT
DUNKLIN
MISSOURI RIVER
MISSISSIPPI RIVER
PINE RIVER


BROWN-SPOT NEEDLE BLIGHT
1981
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
MERCER
SULLIVAN
SCHUYLER
CLARK
HOLT
KNOX
LEWIS
HARRISON
ADAIR
ANDREW
DE KALB
GRUNDY
LINN
SHELBY
MARION
DAVIESS
CLINTON
BUCHANAN
LIVINGSTON
CHARITON
MACON
MONROE
RALLS
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REYNOLDS
CAPE GIRARDEAU
DADE
WEBSTER
WRIGHT
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BOLLINGER
SCOTT
CARTER
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STODDARD
NEWTON
CHRISTIAN
DOUGLAS
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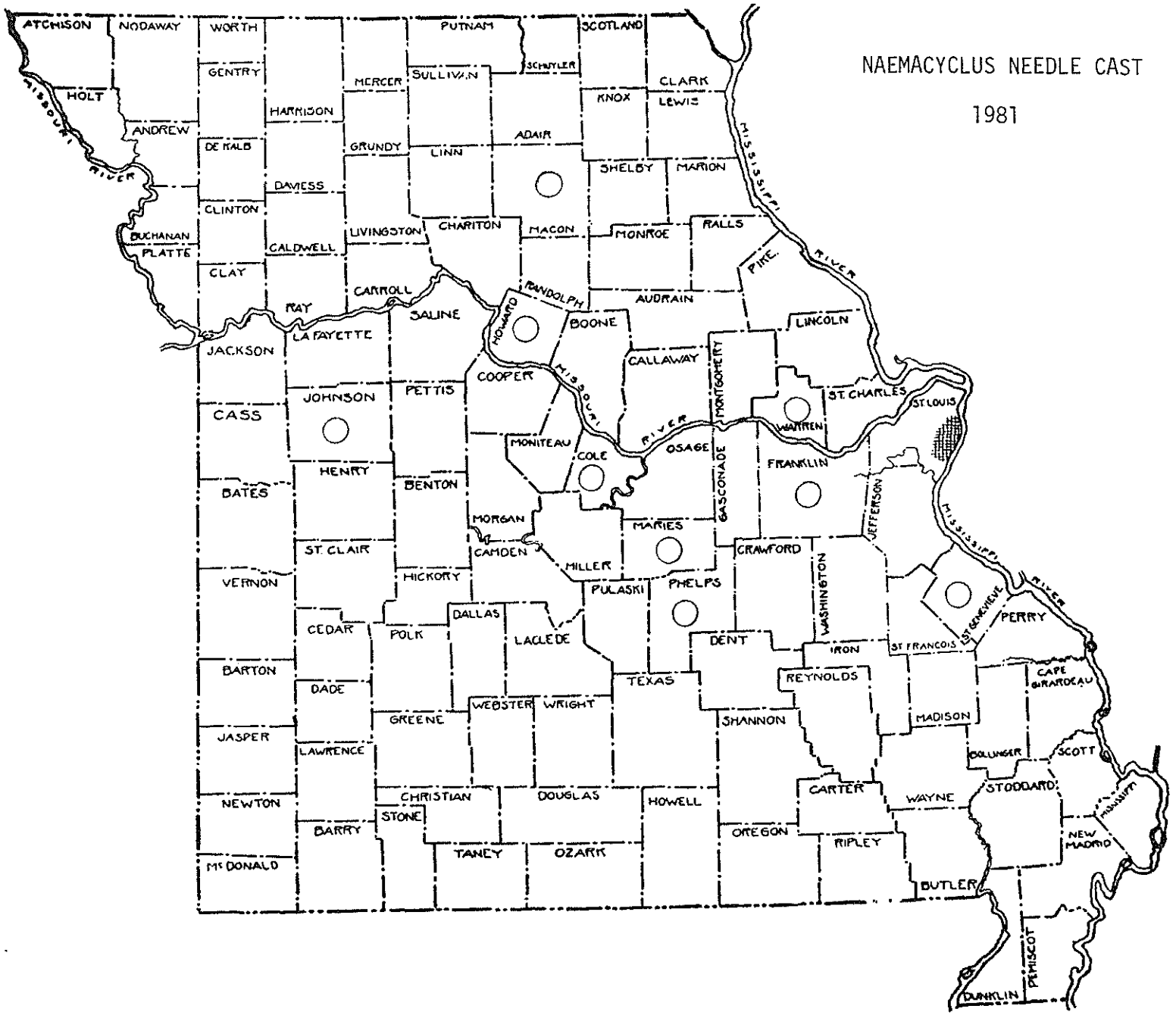
NEW MADRID
BARRY
RIPLEY
TANEY
OZARK
Mc DONALD
BUTLER
DUNKLIN
PEMISCOT
MISSOURI RIVER
MISSISSIPPI RIVER


NAEMACYCLUS NEEDLE CAST
1981
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SCHUYLER
CLARK
HOLT
MERCER
SULLIVAN
KNOX
LEWIS
HARRISON
ANDREW
ADAIR
DE KALB
GRUNDY
LINN
SHELBY
MARION
DAVIESS
CLINTON
LIVINGSTON
CHARITON
MACON
MONROE
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JACKSON
LAFAYETTE
CALLAWAY
MONTGOMERY
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ST. CHARLES
ST. LOUIS
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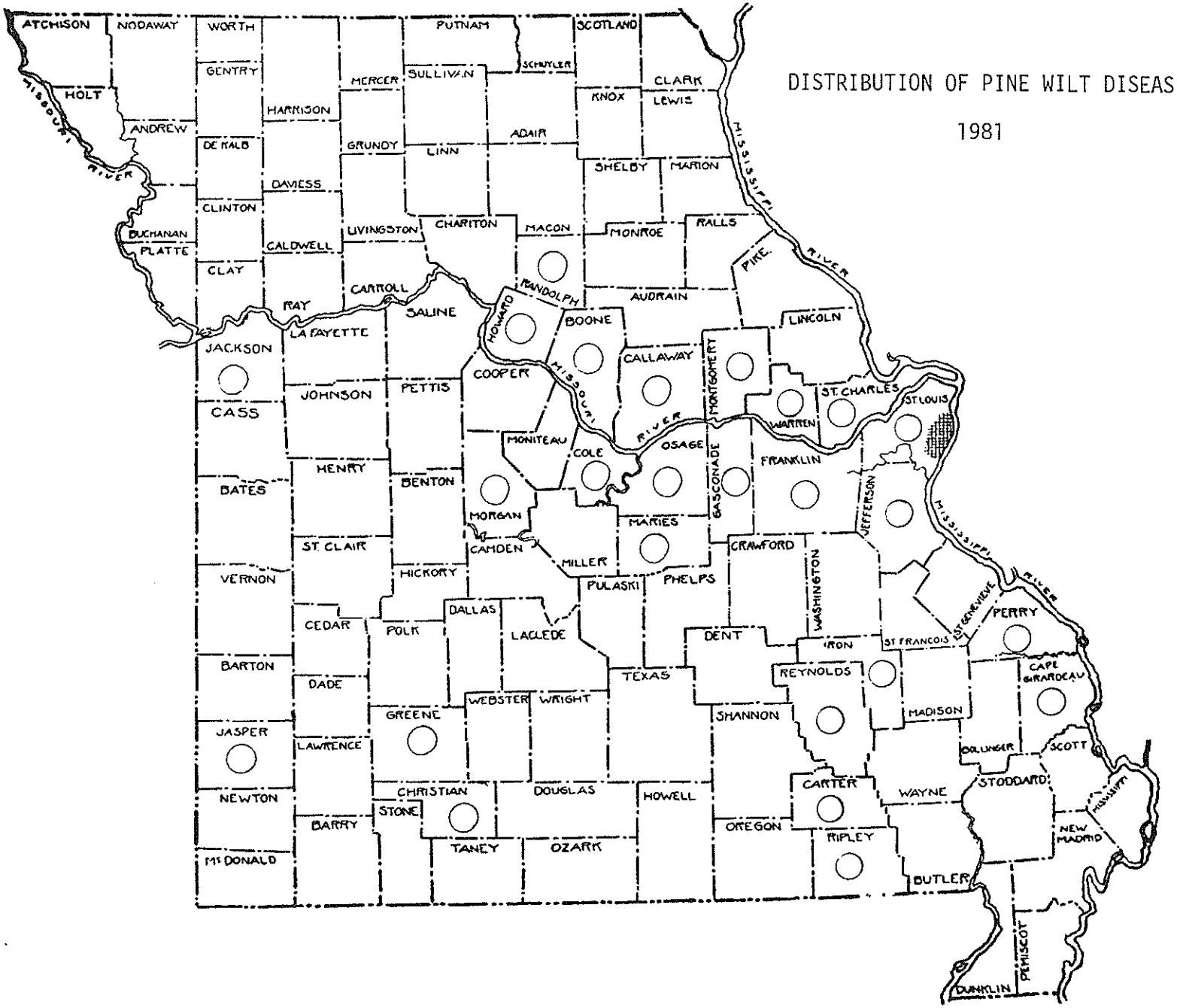
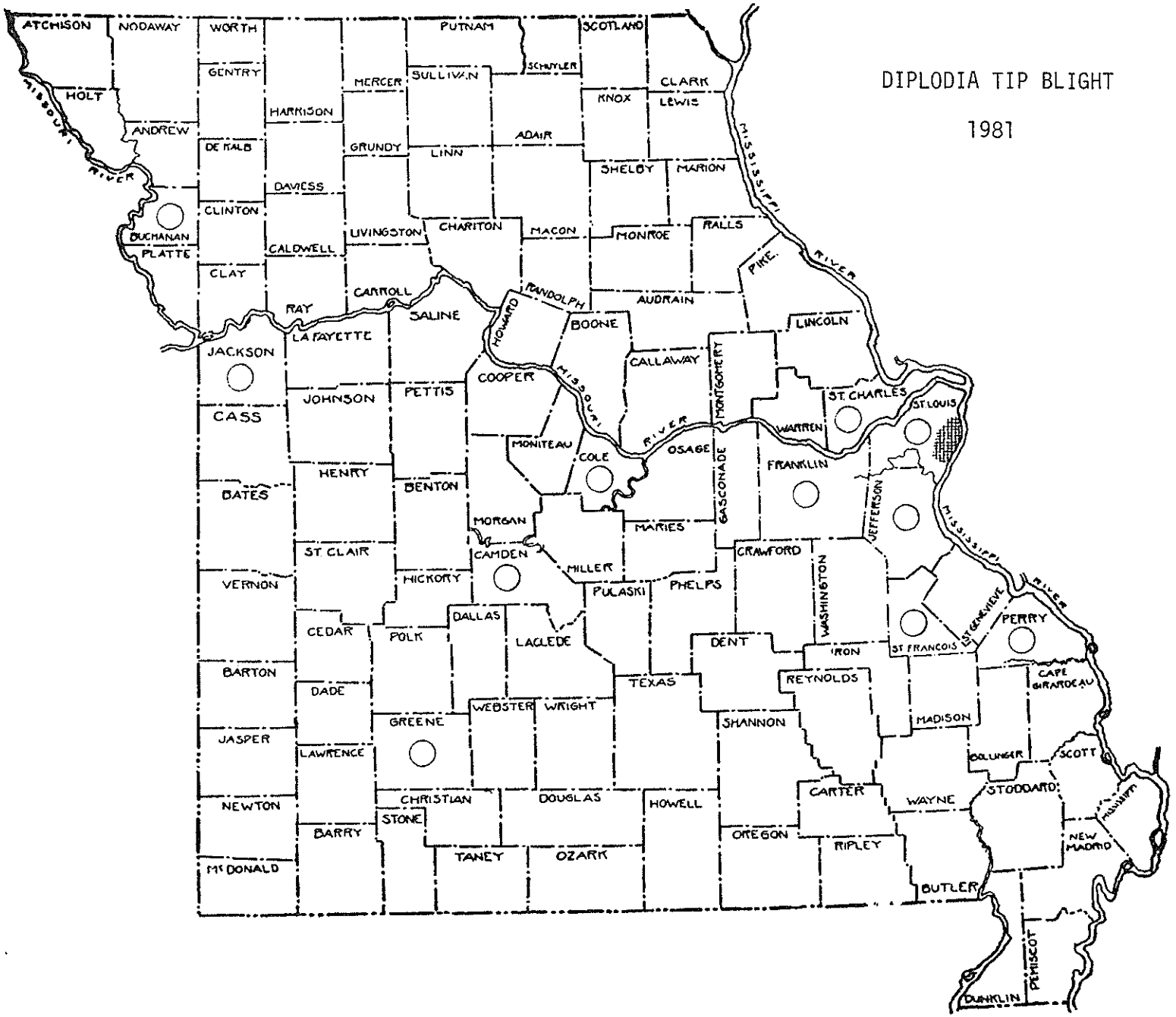
DENT
IRON
ST. FRANCOIS
STE. GENEVIEVE
BARTON
TEXAS
REYNOLDS
CAPE GIRARDEAU
DADE
WEBSTER
WRIGHT
MADISON
GREENE
SHANNON
JASPER
LAWRENCE
BOLLINGER
SCOTT
CHRISTIAN
DOUGLAS
HOWELL
CARTER
WAYNE
STODDARD
NEWTON
STONE
OREGON
RIPLEY
NEW MADRID
BARRY
TANEY
OZARK
MCDONALD
BUTLER
PEMISCOT
DUNKLIN
MISSOURI RIVER
MISSISSIPPI RIVER


DISTRIBUTION OF PINE WILT DISEASE
1981
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SCHUYLER
CLARK
MERCER
SULLIVAN
HOLT
KNOX
LEWIS
HARRISON
ANDREW
ADAIR
DE KALB
GRUNDY
LINN
SHELBY
MARION
DAVIESS
CLINTON
LIVINGSTON
CHARITON
MACON
MONROE
RALLS
BUCHANAN
CALDWELL
PLATTE
CLAY
CARROLL
RANDOLPH
AUDRAIN
PIKE
RAY
SALINE
HOWARD
BOONE
LINCOLN
LAFAYETTE
JACKSON
CALLAWAY
MONTGOMERY
COOPER
ST CHARLES
ST LOUIS
JOHNSON
PETTIS
WARREN
MONITEAU
COLE
OSAGE
FRANKLIN
CASS
HENRY
BENTON
BATES
MORGAN
MARIES
GASCONADE
JEFFERSON
ST CLAIR
CAMDEN
CRAWFORD
MILLER
PULASKI
PHELPS
VERNON
HICKORY
WASHINGTON
DALLAS
PERRY
CEDAR
POLK
LACLEDE
DENT
IRON
ST FRANCOIS
STE GENEVIEVE
BARTON
TEXAS
REYNOLDS
CAPE GIRARDEAU
DADE
WEBSTER
WRIGHT
MADISON
GREENE
SHANNON
JASPER
LAWRENCE
BOLLINGER
SCOTT
CHRISTIAN
DOUGLAS
HOWELL
CARTER
WAYNE
STODDARD
NEWTON
STONE
OREGON
NEW MADRID
BARRY
TANEY
OZARK
RIPLEY
MC DONALD
BUTLER
DUNKLIN
PEMISCOT
MISSOURI RIVER
MISSISSIPPI RIVER


DIPLODIA TIP BLIGHT
1981
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SCHUYLER
CLARK
HOLT
MERCER
SULLIVAN
KNOX
LEWIS
HARRISON
ANDREW
ADAIR
DE KALB
GRUNDY
LINN
SHELBY
MARION
DAVIESS
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LIVINGSTON
CHARITON
MACON
MONROE
RALLS
BUCHANAN
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SALINE
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LAFAYETTE
COOPER
CALLAWAY
MONTGOMERY
ST CHARLES
ST LOUIS
JOHNSON
PETTIS
CASS
MONITEAU
COLE
OSAGE
WARREN
FRANKLIN
HENRY
BENTON
BATES
MORGAN
MARIES
GASCONADE
JEFFERSON
ST CLAIR
CAMDEN
MILLER
CRAWFORD
VERNON
HICKORY
PULASKI
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WASHINGTON
DALLAS
PERRY
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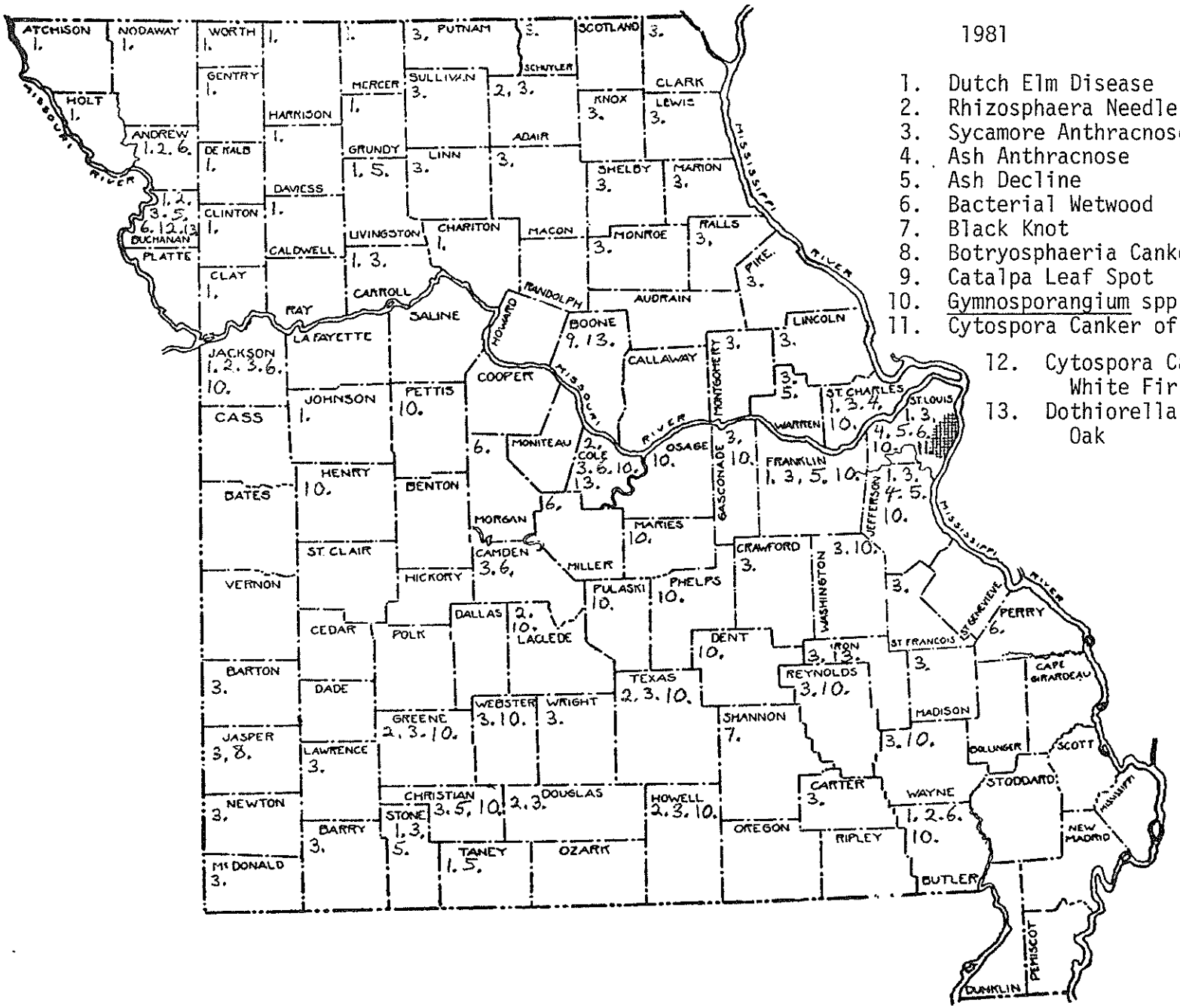


FOREST DISEASES

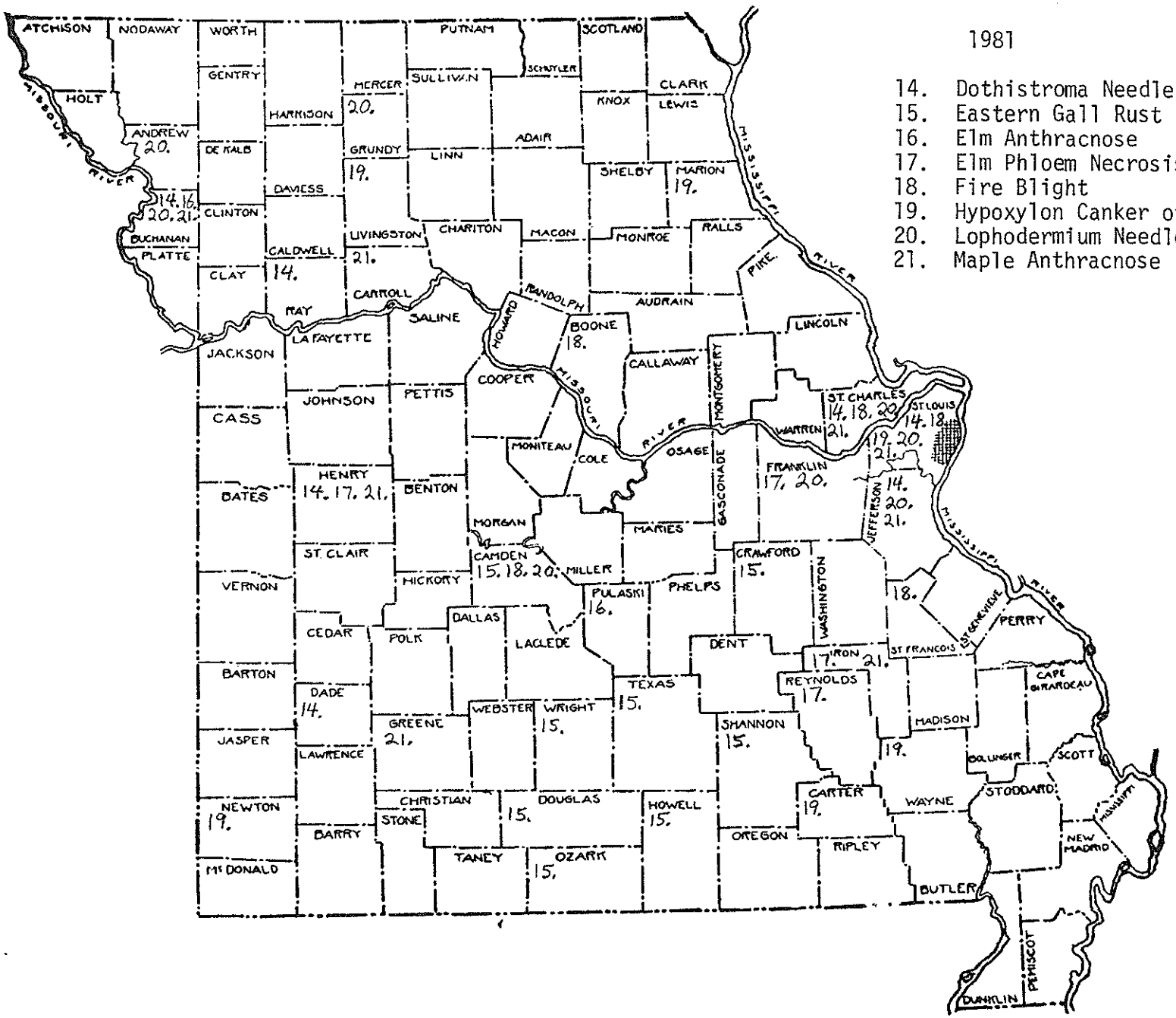
1981

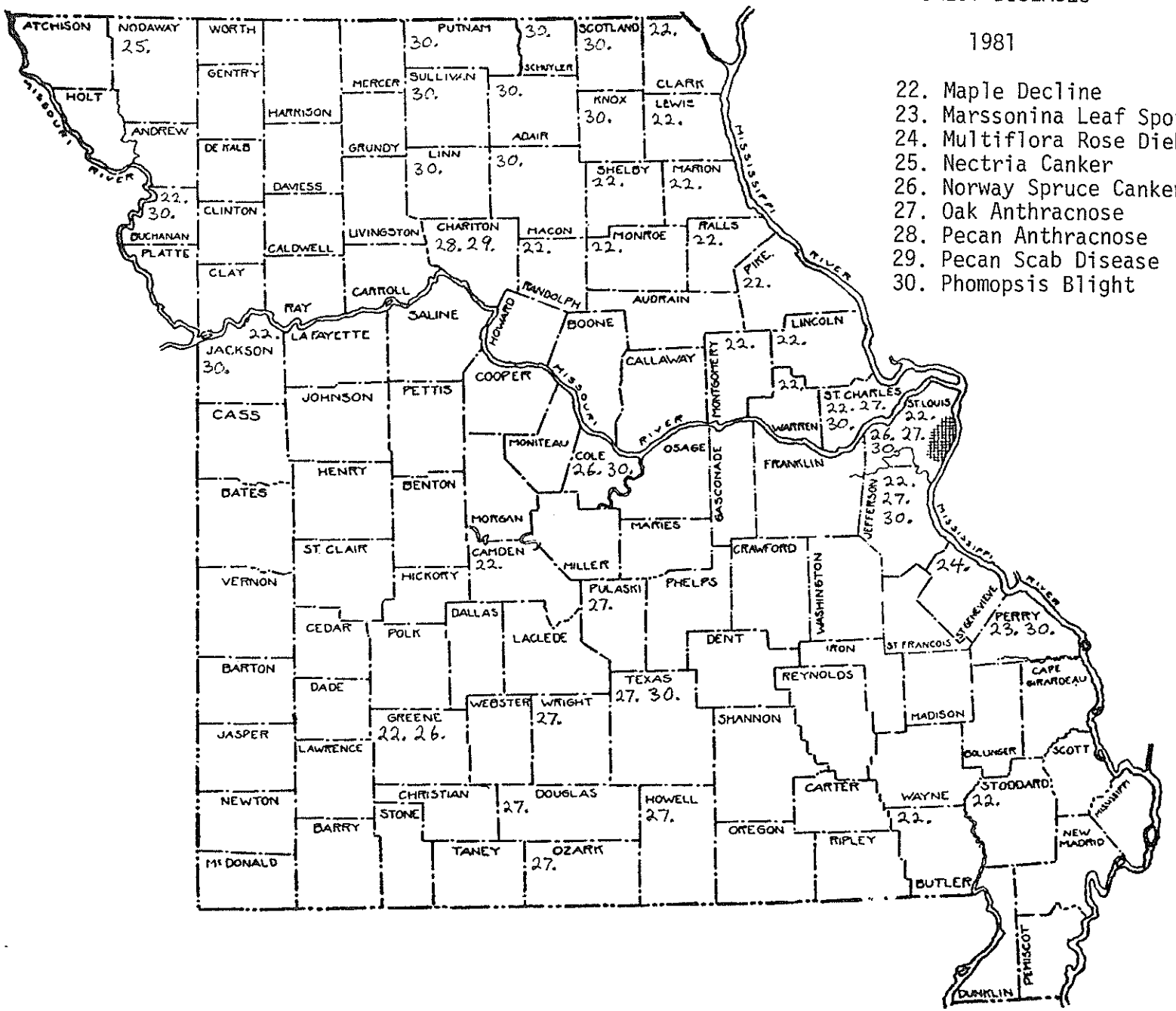
1. Dutch Elm Disease
2. Rhizosphaera Needle Cast
3. Sycamore Anthracnose
4. Ash Anthracnose
5. Ash Decline
6. Bacterial Wetwood
7. Black Knot
8. Botryosphaeria Canker
9. Catalpa Leaf Spot
10. Gymnosporangium spp.
11. Cytospora Canker of Sassafras
12. Cytospora Canker of White Fir
13. Dothiorella Canker of Oak

FOREST DISEASES

1981

14. Dothistroma Needle Blight
15. Eastern Gall Rust
16. Elm Anthracnose
17. Elm Phloem Necrosis
18. Fire Blight
19. Hypoxylon Canker of Oak
20. Lophodermium Needle Cast
21. Maple Anthracnose

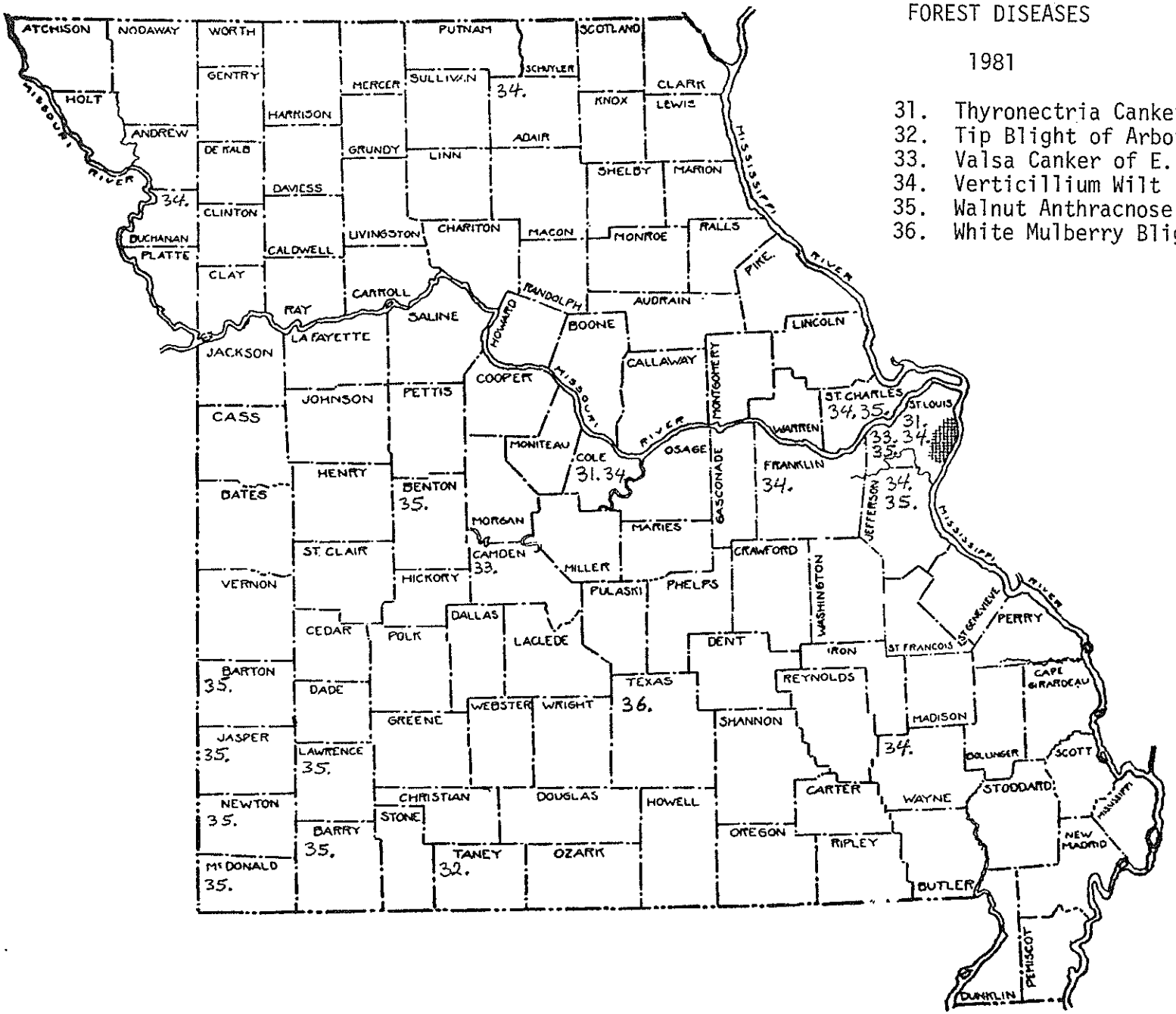




FOREST DISEASES

1981

22. Maple Decline
23. Marssonina Leaf Spot of Ash
24. Multiflora Rose Dieback
25. Nectria Canker
26. Norway Spruce Canker
27. Oak Anthracnose
28. Pecan Anthracnose
29. Pecan Scab Disease
30. Phomopsis Blight



FOREST DISEASES

1981

31. Thyronectria Canker
32. Tip Blight of Arborvitae
33. Valsa Canker of E. White Pine
34. Verticillium Wilt
35. Walnut Anthracnose
36. White Mulberry Blight